Reasons for the delays of Public Buildings

Casestudy of Building for Department of Civil Engineering at Aalborg University 2011-2017

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Publication date:
2017

Document Version
Publisher's PDF, also known as Version of record

DEPARTMENT OF CIVIL ENGINEERING
AALBORG UNIVERSITY

REASONS FOR THE DELAYS OF PUBLIC BUILDINGS

Casestudy of Building for Department of Civil Engineering
at Aalborg University

2011-2017

Mai Brink Rasmussen
PhD student in design processes

ISSN 1901-726X
DCE Technical Report No. 228

Aalborg University
Department of Civil Engineering
Architectural Engineering

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Reasons for the delays of Public Buildings: Casestudy of Building for Department of Civil Engineering at Aalborg University 2011-2017

by

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May 2017

Published 2017 by
Aalborg University
Department of Civil Engineering
Thomas Manns Vej 23
DK-9220 Aalborg Ø, Denmark

Printed in Aalborg at Aalborg University

ISSN 1901-726X
DCE Technical Report No. 228

PREFACE

Worldwide, new buildings are prone to time and cost overruns. The time and cost overruns have many financial repercussions for both the professional builders and the users occupying the buildings. Digital approaches are developed to assists the building process so as to ensure a minimum of time and cost overruns. However, the problem is not solved.

This report focuses on the reasons for the delay of a case of a public building aimed at the Department of Civil Engineering at Aalborg University in Denmark. This building project was delayed for three years. Something went wrong, but what were the mechanisms of the project deviating from the intended date of approval in June 2014 to the realised date of approval, which has not been reached yet, as of May 2017?

The aim of this report is to give an overview of the design process of the building project to investigate the reasons for the delay of the building project. This report does not conclude on what went wrong caused by the complexity of the case but identifies an amount of reasons for the delays.

The report is conducted based on six years of participant observations of the building project and 81 minutes covering the official meetings of the design process in the period of August 2011 to October 2015. The researcher was involved in the building project as an end-user. During the building process, the researcher of the present report became more involved in the building project by being the substitute for the Head of Department and further a part of the steering group of the project. For the first year, the researcher was not aware of the research potential of the building project, but in 2012, after numerous time overruns, the specific building project became the research basis for improvements of design processes of public buildings. The close involvement had the potential of making the researcher too involved in the project and prevented having a scientific distance to the project. To oblige this claim, this report is developed three years subsequent to the design process, which is the focus of this report. With three years in between, the personal distance to the project improves the scientific approach, and further research questions and methodological approaches to analysing the data of the building project make the scientific approach to the report.

The analysis of both the minutes and the participant observations are theoretically based on Practice Theory. Grounded Theory Method has been used for structuring the complexity of the project, while Activity Systems has been used to analyse the specific activities causing both time and cost overruns of the project.

READING INSTRUCTION

This report covers a complex building project which is based on participant observations. The report aims at describing the content of the building project process during six years. The complexity of the project causes multiple stories about the building project process which are important for the author in order to understand the background of the building project process. As a consequence, this report is divided into a fiction story based on a true story about the building project, which is presented on grey paper. Within each chapter of the story, various practices occurs, which subsequently to each chapter is described and analysed based on theory and literature review.

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MURDER OF THE BUILDING PROJECT

It is a grey Friday morning. The sun has risen, and the wind is blowing softly. The seagulls wake me up by their screams as they fly by the fields next to my site. A modest beginning of people arriving at my site and a soft bubbling of life in me initiates the feeling of being awake.

Not totally awake, because I am dead.

I was the one who got killed.

I am the building.

THE START-UP

This story began in the summer of 2011. A group of people from the University, both researchers and students, were ready for and happy about the future reception of their new building. They loved their old building, but the majority of the people realised the opportunities of moving into new spaces with new equipment and new technologies. A start-up meeting collecting all participants, both building owner, advisory group and users, was about to begin. All participants had brought their own ambitions of the project in relation to their ideas and requirements. PowerPoint slides mediated the ideas of the participants, and the mood and energy levels were high. The end-users had never tried this process before, due to the fact that they had never moved to a new building. They had been in the same building for 25 years, and now the financial aspects of the building did not allow the participants to be in the building anymore. Moreover, the University had a strategy of collecting all Departments of the University at two locations in the city: Campus City and Campus East. For this reason, the end-users were forced to move. However, the majority were looking forward to the move.

Contrary to the situation of the end-users, the building owner and the advisory group had, previously and repeatedly, conducted similar processes. In fact, the same participants of the advisory group, containing an architectural company, an engineering company and a landscape architectural company, worked together on an ongoing project for the Department of Biotechnology. Unfortunately, that building project was not a success due to multiple delays and poor involvement of the end-users in the process. As result from these mistakes, the slogan of the new building project for Department of Civil Engineering was "It must not be a Bio-case". Everybody laughed and smiled, and they agreed upon the fact that a case like the Bio-case should never be repeated. To avoid a similar bad experience as the Bio-case, the building owner decided to enforce the involvement of the end-users at the beginning of the project. Further, the building owner intended to cut out the end-users of the project when the conceptual phase of the project was completed, and the structural phase of the project was initiated. The intention of this procedure was to keep the building budget without extensions caused by new suggestions and requirements of the end-users. With this procedure, the requirements and dreams of the end-users were listened to in order to avoid additional requirements during the building process.

At the end of the start-up meeting, the participants were still in a good mood. However, the building owner was slightly scared of the green roofs and the large living labs that the end-users dreamed of. Additionally, the advisory group was slightly scared of the strict demands of the building owner and the high ambitions of the end-users. Moreover, the end-users were slightly disappointed about the strict requirement from the building owners. However, they all intended to make this building the state-of-the-art of new University buildings and laboratories as an icon in the Architectural, Engineering and Construction (AEC) sector.

To be continued at page 34...

PHASES OF THE BUILDING PROCESS

Commonly, a building project is divided into multiple phases. According to Ramboll, who is the engineer on this project, the common phases of a project are the following (Ramboll, 13-9-2011) (Figure 1):

- Programming (In Danish 'Programmering'): Description of owner and user requirements through space programs and space specification.
- Disposition proposal (In Danish 'Dispositionsforslag'): Description of the architectural idea, the function and general materials, structural principles, and thoughts about the usability of the building.
- Project proposal (In Danish 'Projektforslag'): Functional, aesthetic and technical solutions according to the budget and the demands of the clients. Necessary registration for the upcoming work has to be completed by the end of this phase. The form of procurement has to be decided at the end of this phase.
- Pre-project (In Danish 'Forprojekt'): Accomplishment of the project proposal as an authority approval.
- Main project (In Danish 'Hovedprojekt'): Documentation of the outline, description of the building project, technical drawings, timeline, tender lists and demands for performance and maintenance.
- Tendering (In Danish 'Udbud og kontrahering'): Contractors are selected to tender for the project, and one contractor team wins the project.
- Construction (In Danish 'Udførelse'): The physical building project is initiated at the site. The advisory group follow-up on the project, make a technical inspection and conduct construction management.

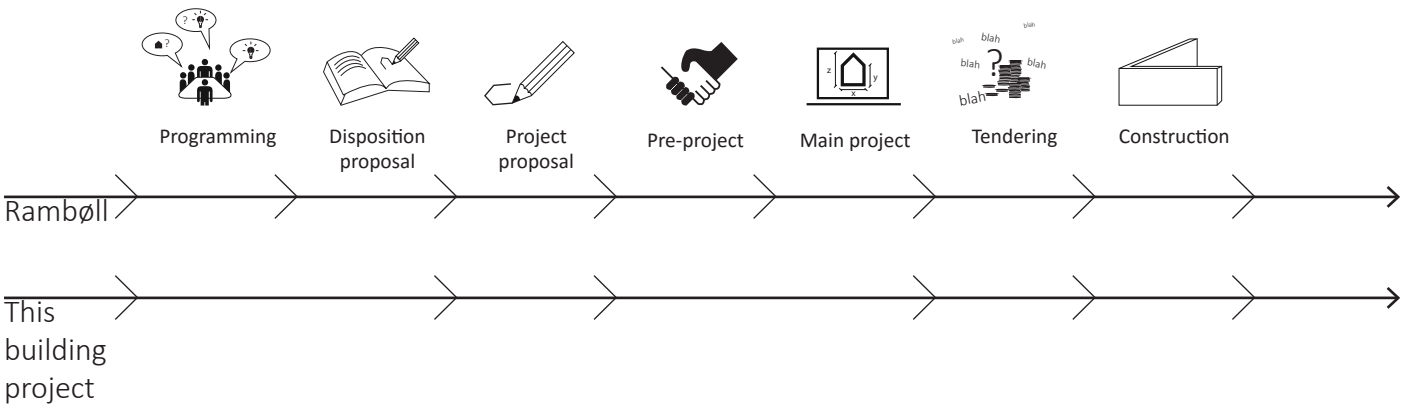


Figure 1: The project phases of Ramboll and this project

At the first meeting, the advisory group informed, that the building owner and the University have shortened the pre-planning phase by 2-3 months according to the common procedure for the advisory group. As visualised in Figure 1 and Figure 2, the phases of the project and thereby the approval procedure were changed to these:

1. Programming and disposition proposal
2. Project proposal
3. Detailed project with part assignment of the authority approval
4. Tendering
5. Construction
6. Assignment
7. Performance

In this report, phases 1-3 are referred to as the design process (Figure 2).

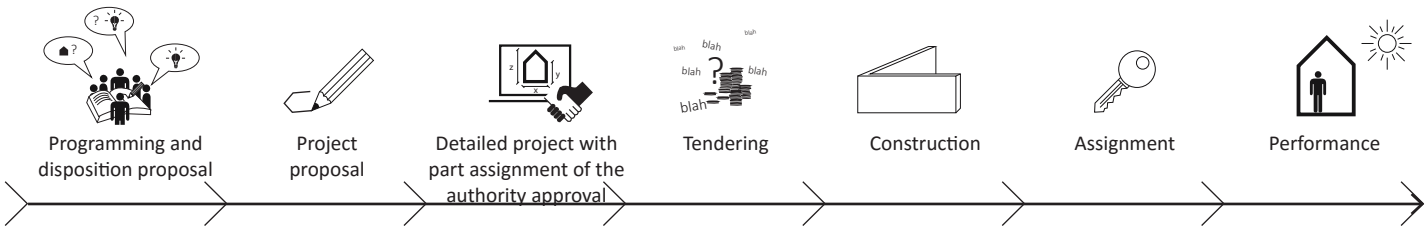


Figure 2: The design process of this project

PARTICIPANTS OF THE BUILDING PROJECT

The design process involved the building owner, the advisory group and the users. In this report, these terms are called Profession (Figure 3). Within each Profession, there can be various Participants who in this report refer to the people related to the organisation where they are employed such as BYGST, Campus Service (CS) and Department of Civil Engineering (DCE). Within each Participant, there can be different Actors which in this report is related to the specific person such as Mai (MR) and Peter (PF) (Figure 3).

The scheme in Figure 4 indicates the Profession, the Participant, and the Actor of the design process of this building. Each category has various competencies, which is why the following sub-chapters describe the Professions, the Participants and the Actors involved in the design process of the new building for DCE and how they were selected.

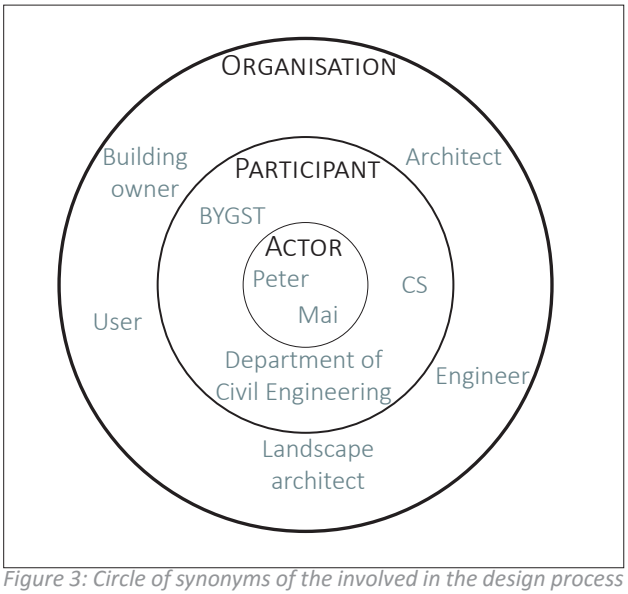


Figure 3: Circle of synonyms of the involved in the design process

Profession	**Participants**	**Actor**
Advisor: Engineer	Ramboll	L
Advisor: Architect	Kjaer & Richter	P
Advisor: Landscape architect	Møller & Grønborg	J, M
Building owner	Danish Building & Property Agency (BYGST)	B, PR
Tenant	Campus Service (CS)	MH, T, TK, H, TG
User	Faculty of Engineering and Science (FES)	BG, E
User	Department of Civil Engineering (DCE)	PF, MR
End-user	Employees at DCE	Multiple

Figure 4: Scheme of Profession, Participant, and Actor

Building owner

The building owner is the organisation paying for the building project. The building owner hires the advisory group, which is why the building owner has the main communication with the advisory group and pays their fees. The building owner is responsible for the main decisions of the building project, and for this reason, the building owner has the final word.

In this building project, the building owner is the Danish Building & Property Agency (BYGST). BYGST is representative of the State and administrates the buildings owned by the State, making BYGST one of the largest public building administrations in Denmark (Susanne Søderdahl Thomassen, 2015b). The total building stocks owned by BYGST cover approximately three million square meters. Additionally, BYGST administrates one million square meters owned by private companies and OPP projects (In Danish 'Offentlig-Private Partnerskaber' and English 'Public-Private Partnering'). The buildings administrated by BYGST occupy Universities, Departments of State, Courts of Law, and the Police (Susanne Søderdahl Thomassen, 2015a). The total building stock of the Universities covers 2.1 million square meters, which approximately is half of the portfolio of BYGST (Susanne Sønderdahl Thomassen, 2016).

The organisations rent the buildings from BYGST. BYGST is responsible for planning and financing larger, new buildings and further for maintaining the exterior of the buildings and the surrounding areas (Teknisk Forvaltning, 2015). The rent agreement is called SEA agreement (In Danish 'Statens Ejendomsadministration' and English 'The Real Estate Management of the Government'). The SEA agreement was developed on the basis of a 1999 report containing recommendations for improving the impact of efficient usability of the public building. In 2001, the SEA agreement was founded, which included Universities and some Departments of the State, the Court of Law, and the Police (P. E. Pedersen, 2016). The main reasons for renting the building from BYGST are as follows:

- A professional property manager is maintaining the buildings, for the renter to focus on their key-profession contrary the building blocks (Hermansen, 2016; Susanne Søderdahl Thomassen, 2015b).
- A professional property manager is ensuring efficiency of the usability of the square meters for the money, allocated by the Government to the public organisations, to be spent on the profession of the organisation contrary the rent of the building (Hermansen, 2016).
- By renting from BYGST, it is possible to resign a rent contract without changing the yearly budget of the organisation according to the allocated fee from the Government to the specific organisation (Hermansen, 2016).

In recent years, a number of Danish Universities complain about the fact that the Universities are forced to rent buildings from BYGST contrary to being freeholders. Copenhagen University has complained about the renting procedure to public newspapers, which is why Copenhagen University is exemplified in some arguments.

- The Barcelona Stated Objectives dictate that at least 1% of the BNP of the country has to be used for education and research. Without the current rent from the Universities to BYGST, the national budget will not succeed in fulfilling the 1% of the BNP to education and research, because the Government would not receive the overhead from the rent (Stobbe, 2016).
- The Government gains money on the rent from the Universities because the changes of the percentage of the public raising of loans from 72% to 80% are not allocated the public renters, which is why the rent of the public organisations is constant (Finansministeriet, 2006; Hermansen, 2016). For this reason, the Government gains money from the rent of the Universities, but the Universities interpret this as implicitly taking money from research and education to give to other areas of the society (Hermansen, 2016; N. S. Pedersen, 2015).

In general, there is an expectation of a new reform of Danish Universities within a reasonable time. The new reform is expected to merge the institutions of various Danish Universities to avoid the Governmental forced budget savings of 2% per year of the total budget for each University in Denmark (Hermansen, 2016).

- BYGST has a portfolio of three million square meters in total with the Universities covering 2.1 million of these square meters. If the Universities buy the buildings and have freehold, BYGST decreases in money and employees (Susanne Sønderdahl Thomassen, 2016).
- If all Universities have freehold, every University have to buy the buildings from the Government. The buildings that Aalborg University occupies in Aalborg are cheaper than the buildings that Copenhagen University occupies in the centre of Copenhagen. For this reason, Copenhagen University might not have enough money to buy the buildings from the Government and has to decrease the number of square meters resulting in less amount of students.
- Opposite, if the budget of Copenhagen University allows buying the buildings, there is an issue of how to set the price according to the market.
- In addition to the previous point, if Copenhagen University owns the buildings, there is a possibility that the University speculates in selling the building to gain money on the building stock to become richer than the other Universities because of their location and possibility to sell their buildings more expensively than the buildings of Aalborg University.
- Contrary, if Copenhagen University owns the buildings, there is a possibility of an increased budget to renovate their buildings, and at this moment spend less money on research and being less attractive caused by a lower level of research.

The employees at BYGST covers multiple professions such as project leaders, economists and lawyers. BYGST has its main office in Copenhagen and an office in Skanderborg. During the first part of the design process, the project leader for BYGST was situated in Skanderborg and is in this report referred to as B, while the second half of the design process, a project manager from Copenhagen, referred to as PR, occupied the position of the project manager. PR followed the project through. During the construction phase, a new employee at BYGST referred to as L substituted PR. This report focuses on the design process, which is why B and PR are mentioned as the involved Actors (Figure 5).

The participants of BYGST were selected internally in BYGST according to their previous task of projects and political agendas within BYGST.

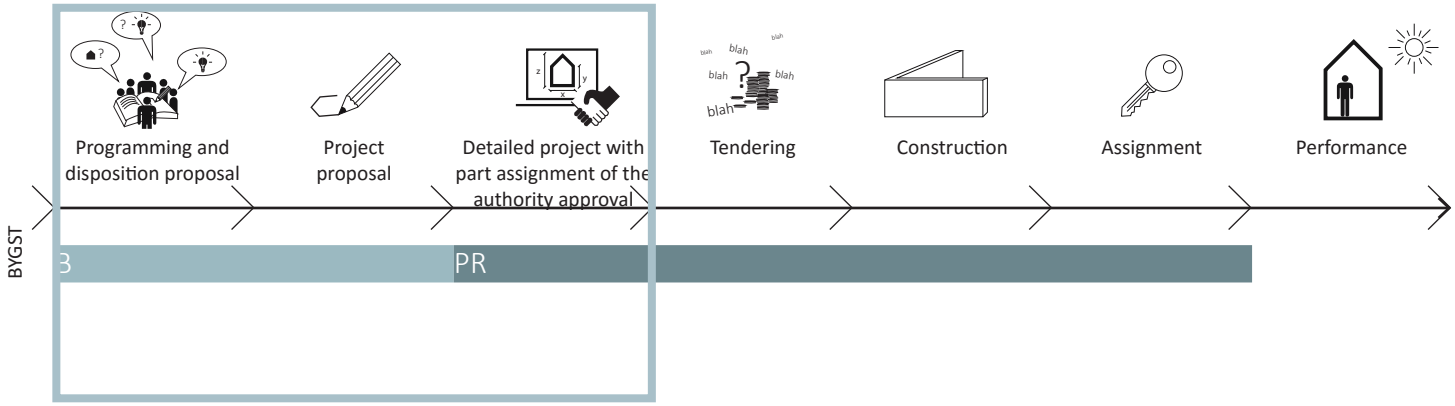


Figure 5: Phases of involvement of the participants of BYGST

Advisory group

The advisory group is divided into three parts: Engineer, architect and landscape architect.

The architect

The architect is responsible for the design of the building. The architect's design buildings are intended to be occupied by people, which is why they consider the flow, looks and organisation of the building.

In this building project, the architect is Kjaer & Richter. Kjaer & Richter is an architectural company founded in 1967 by Werner Kjær (1924-1998) and Johan Richter (1995-1998) (Wikipedia, 2016). The company is a continuation of the architectural company Richter and Gravers by Johan Richter and Arne Gravers. Richter and Graversen were initiated with the first prize of a Governmental building project for a new upper secondary school by the Government (Kjaer & Richter, 2016). Nowadays, Kjaer & Richter has expanded with architectural companies in both Aarhus and Copenhagen in Denmark, employing both architects and construction managers (Kjaer & Richter, 2016).

Mainly two architects represented Kjaer & Richter during the building process. One architect was in charge of the design process, and another was in charge of the construction part. At some meetings, the main architect was supported by other architects of Kjaer & Richter. The main architect is referred to as P, and the second architect is referred to as PS (Figure 6).

Kjaer & Richter was chosen as the architect of this building project based on a framework agreement made by BYGST called the Seven Sisters. The Seven Sisters are seven advisory groups selected every fourth year to be a part of the team of advisory groups. The advisory groups are divided into three geographically areas of Denmark: Zealand, South of Denmark, and Middle and North of Denmark. The aim of the seven sisters is to ease the process of the public organisations when building a new public building without making expensive competitions for each project.

Based on the preselection of the advisory group, the advisory group is a part of the process before they propose a conceptual design. This is opposite to a private competition, which often is a contest among multiple advisory groups competing based on the best proposal for the Building Program. With the SKI agreement (In Danish: Statens og Kommunernes Indkøbsaftale and in English: The States and the Municipalitys Procurement agreement), the consultant team is a part of the process from the initiation of the project, which creates the opportunity to develop a holistic building suiting the context and the use of the building.

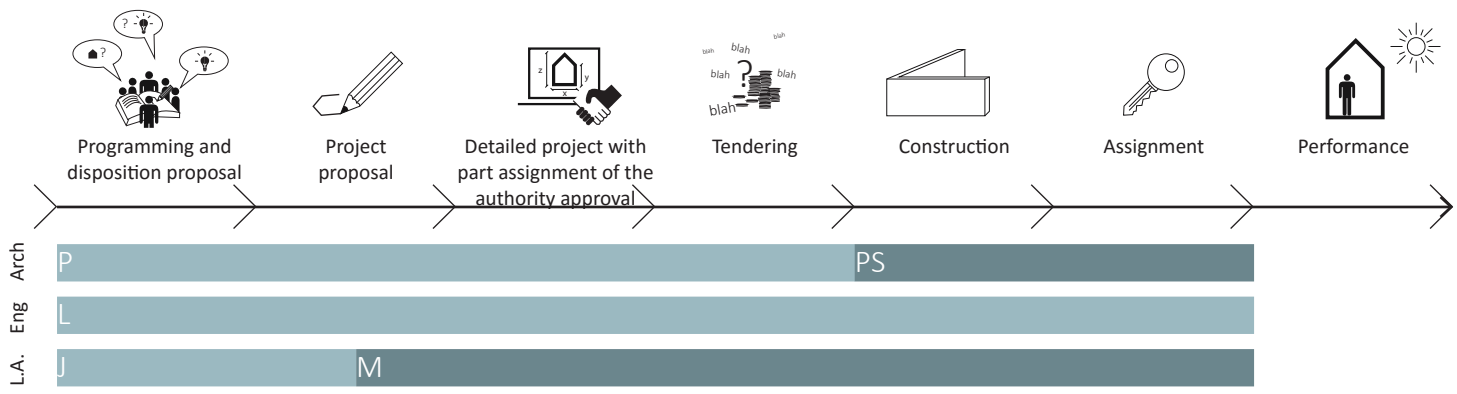


Figure 6: Phases of involvement of the participants of group of advisors

The engineer

The engineer is responsible for developing the technical aspects of the building such as calculations and solutions according to the structural principles and the energy consumption of the building.

In this building project, the engineer is Ramboll. Ramboll is a Danish company occupying 13,000 engineers, designers and management consultants all over the world, with 3,100 of them situated in Denmark (Ramboll, 2016). Originally, Ramboll was a Danish engineering firm initiated in 1945. Nowadays, Ramboll covers all engineering aspects such as buildings, transport, water, environment and oil (Ramboll, 2016).

Similar to the architects, Ramboll was chosen as the engineer on the basis of the framework agreement called the seven sisters.

In this building project, Ramboll was represented by one project manager during the entire project. Further, during the process, additional engineers were involved in covering various topics such as energy, electricity, ventilation and water.

The leader of the engineers is referred to as L, as he was the main involved actor (Figure 6).

The landscape architect

The landscape architect is responsible for the outdoor areas of the building such as the arrival area of the building, parking areas and planting of the areas. The landscape architect often works in close relation to the architect, to fulfil the visions of the building.

In this building project, the landscape architects are Møller & Grønborg. Møller & Grønborg is a Danish Architect- and Landscape company situated both in Aarhus and Copenhagen (Møller & Grønborg, 2016b). Møller & Grønborg was founded in 1960. Primarily, they develop projects nationally while they do have some international projects (Møller & Grønborg, 2016a).

Two landscape architects represented Møller & Grønborg during the process. They did not attend the majority of the meetings due to their minor impact on the building project compared to the architect and the engineer. However, they received the minutes from the meetings as an update on the decisions of the project. When the theme of the meeting was outdoor spaces, the landscape architects were present at the meeting. The first involved actor is referred to as J, and the second is referred to as M (Figure 6). The reason for the change of actor was a change of company for the first actor, J.

User

Within building projects of Danish Universities, there are multiple users. Some of the users are the end-users occupying the building physically, while others are paying for the building or involved politically. As illustrated in the hierarchy in Figure 8, there are five levels of users. Within each level, there are multiple users. Because of the money flow of the University from the rent, all users have a voice, which is why the complexity of this process is high.

Organisation of Aalborg University

Aalborg University is one of eight universities in Denmark (Danske Universiteter 2016a). The main offices of the eight universities are situated in Aalborg, Aarhus, Odense, Roskilde, Lyngby and Copenhagen (Figure 7).

The majority of the Universities have subdivisions in other cities such as Aalborg University having subdivisions in Esbjerg and Copenhagen. Aalborg University is a large organisation of 22,784 students and 5,771 employees in 2016 (Aalborg Universitet 2016c). To clarify how Aalborg University is organised, see Figure 8. This diagram illustrates the subdivisions involved in the building project for DCE, and the following description supports the highlighted subdivisions.

Figure 7: Map of the Universities in Denmark

At the top of the hierarchy, the Ministry is situated. The Universities are a part of the Ministry of Higher Education and Science. Since the 29th of February 2016 until the publication of this report to the publication of this report, the Minister of Higher Education and Science has been Ulla Tørnes (Uddannelses- og Forskningsministeriet 2016).

Every year, the National Budget is evaluated according to the allocation of money for the organisation within the public sector. The Universities are a part of the National Budget. In 2016, the Universities were allocated 16 billion Danish kroner (Danske Universiteter 2016b), with the plan of distribution allocated an amount of money for each University. In 2016, Aalborg University received 2.1 billion Danish kroner (Forskningsministeriet 2016), which is illustrated as the second step in Figure 8.

The 2.1 billion Danish kroner was allocated to five faculties within the University and a Shared Service, as shown as the third step in Figure 8. The five faculties are Faculty of Humanistic, Faculty of Social Science, Faculty of Medicine, Faculty of Engineering and Science (FES) and Danish Building Research Institute (Aalborg Universitet 2015c). Each faculty has a dean while the Danish Building Research Institute has a managing director (Aalborg Universitet 2015b).

Within the faculties in total, there are 19 departments and 11 schools (Aalborg Universitet 2015c). This step, number four in the hierarchy, is illustrated for FES. The Departments are subdivisions of the Faculty to organise the main topics of research. Each main topic of research contains various subtopics of research but within the same frame of the profession (Aalborg Universitet 2016d). The Departments is responsible for the research within the University. The DCE is one of the Departments within FES. The Department has a Head of Department, who runs the Department.

Moreover, the Faculties include the Schools, which is illustrated in the centre of Figure 8 as the fourth step. The Schools are responsible for the education

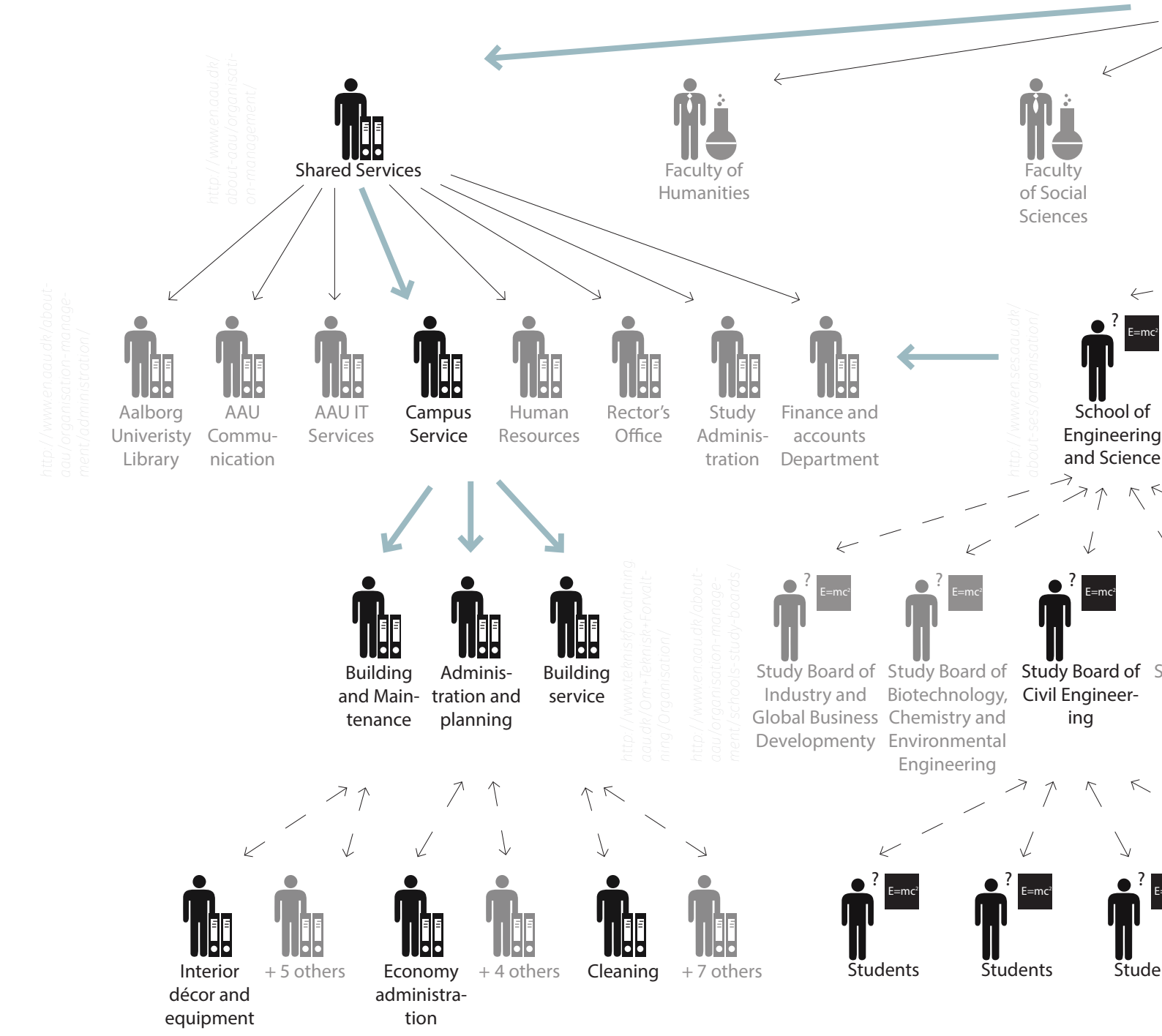
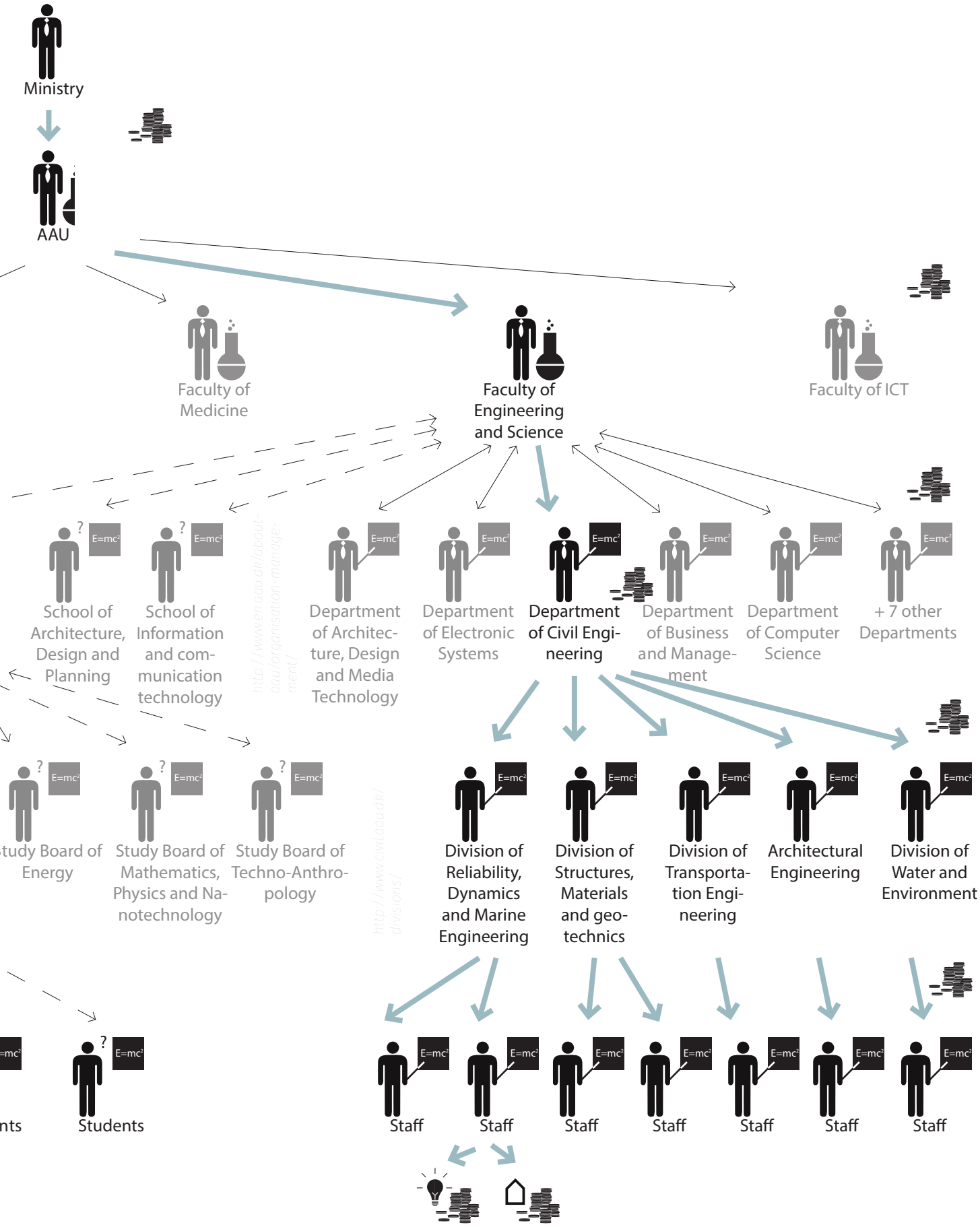


Figure 8: Organisational diagram of Aalborg University


Ministry
AAU
Faculty of Medicine
Faculty of Engineering and Science
Faculty of ICT
School of Architecture, Design and Planning
School of Information and communication technology
Department of Architecture, Design and Media Technology
Department of Electronic Systems
Department of Civil Engineering
Department of Business and Management
Department of Computer Science
+ 7 other Departments
http://www.en.aau.dk/about-aau/organisation-management/
Study Board of Energy
Study Board of Mathematics, Physics and Nanotechnology
Study Board of Techno-Anthropology
Division of Reliability, Dynamics and Marine Engineering
Division of Structures, Materials and geotechnics
Division of Transportation Engineering
Architectural Engineering
Division of Water and Environment
http://www.cwl.aau.dk/divisions/
nts
Students
Staff
Staff
Staff
Staff
Staff
Staff
Staff

at the University. The School rents rooms and teachers from the Department, while the Department is responsible for allocating rooms and teachers to feed the Schools and their needs.

The School of Engineering and Science is affiliated with the Department of Civil Engineering and occupies the same building as Department of Civil Engineering including the students.

The fifth step in the hierarchy is the Divisions within the Department. DCE has divided the Department into five research Divisions (in Danish referred to as 'Videnskabeligt personale' or 'VIP' and in English 'Research Personnel') and two administration Divisions (in Danish referred to as 'Teknisk Administrativt Personale' or 'TAP' and in English Technical Administration Personnel).

Each Division has a Head of Division, and hierarchically below this person, the employees are situated as step six in Figure 8. In 2017, 150 employees at DCE had a workplace in the new building for DCE. The employee in each research division has various terms of employment (Aalborg University 2014; Ebdrup 2014; Sunesen & Svendsen 2007).

The fifth step in the hierarchy within the School is the Study Boards. Within the School of Engineering and Science, there are six Study Boards (Aalborg Universitet 2016d). The Study Board connected to the Department of Civil Engineering is the Study Board of Civil Engineering. The Study Board has a Chairman and a Study Board Secretary.

The sixth step in the hierarchy is the students within the Study Board of Civil Engineering. The students have the possibility of choosing between a Bachelor degree in Engineering for three years, a Bachelor of Engineering for 3.5 years or a Master of Engineering for five years (Aalborg Universitet 2016b). In 2016, there were 450 students to occupy the building for Department of Civil Engineering.

Shared Service is illustrated to the left in Figure 8 as the third step of the hierarchy similar to the Faculties. Shared Service is an internal service at Aalborg University for the students and employees. Shared Service is divided into nine services, which is the fourth step in Figure 8 (Aalborg Universitet 2016e).

The service dealing with buildings is the Campus Service (CS). CS has a Campus Manager being in charge of the Divisions within CS, on the same level as the Head of Department.

CS is divided into three Divisions, which is step five in the hierarchy, similar to the Divisions of the Department and the Study Board for the School.

Each division has a Head of Division and is divided into groups according to tasks.

Within the Division of Building and Maintenance, there are six groups (AAU Campus Service 2016). Every group were represented in the process of the building for DCE at various levels of involvement.

Campus Service

Campus Service (CS) is the building service at Aalborg University. They are responsible for maintaining the buildings of Aalborg University both internally and externally. BYGST, as the building owner, is responsible for the maintenance of the exterior, but they have delegated the task to CS. CS is a large organisation handling a building stock of approximately 290,000 square meters at Aalborg University (Aalborg Universitet, 2015). Within the budget of CS, maintenance is included. However, modifications of buildings are included in the budget of the Faculty or Department, according to the political agenda of the individual Faculty (Teknisk Forvaltning, 2015). When building new buildings, CS projects and completes the building project in collaboration with the end-users of the building (Teknisk Forvaltning, 2015). CS is not physically occupying the buildings, but they are in charge of the maintenance of the buildings, which is why their cleaning staff is the end-users of the buildings along with the janitors. Of this reason, CS is some of the users.

In this project, CS was represented by various employees during the project. At each meeting, there were at least two actors, cf. Figure 9. The involved actors are referred to as both M+T, TK+H and TG+H.

The actors were selected according to the phases of the project and the competencies of the individual actor. All those involved from CS were employees at CS. Further, in this report, CS is referred to as the tenant.

Faculty

The Faculty of Engineering and Science (FES) is hierarchically organised above the DCE. FES is not going to occupy the building but is in charge of the budget for all Departments within the Faculty, which is why they are interested in developing a suitable building for the Department to fulfil their demands on a low budget.

In this project, FES was represented by the building facilitator of the Faculty and on few occasions by the Dean. Figure 9 illustrates the involvement of the participants and the actors. The actors are referred to as BG and E.

End-users (Department)

The Department of Civil Engineering (DCE) is the primary occupants of the building. DCE is responsible for adding useful knowledge for the advisory group concerning the working day at DCE. This information aim is ensuring the development of a building fitting the working tasks of the Department.

The Head of Department was involved in the process. Within the phase of Project proposal, the Head of Department did not have the time for being present at every meeting, which is why a PhD student involved in the building process from the initiation, substituted the Head of Department during the project. The Head of Department is referred to as P, and the substitute is referred to as MR. Their involvement is illustrated in Figure 9.

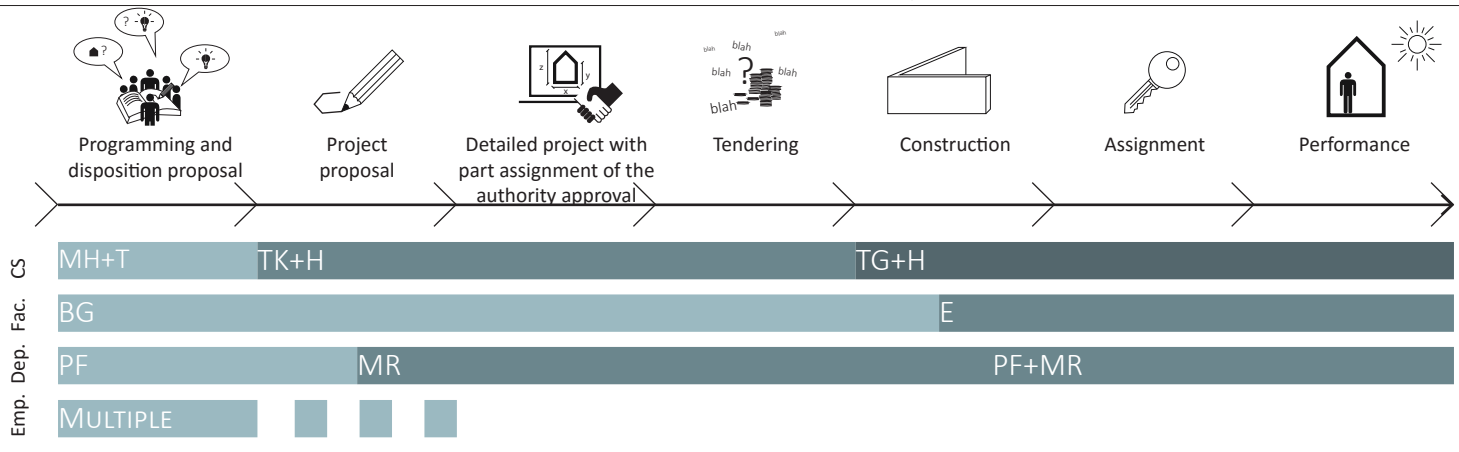


Figure 9: Phases of involvement of the participants of the users

End-users (Employees)

The employees of the building were a mixture of various personalities and terms of employments. They had the responsibility of commenting on the design proposals developed by the advisory group.

In this project, the employees participated in the meeting in the phase of Programming and disposition proposal and sporadic in the phase of Project proposal. The employees represented the employees at the DCE, and their voices were supported by 12 topic groups developed at the Department.

For the meeting, 11 actors were involved. They are referred to as Multiple in Figure 9.

Values at the Department of Civil Engineering

The culture of the end-users is crucial for the understanding of the actions of the end-users. For this reason, the following analysis has been made through participant observation.

The diversity within the field of engineering is broad at DCE, which is indicated by the seven Divisions. The mood board visualises the values and the various research areas at DCE observed by the author (Figure 10). The words added are participant observations by the author and cover Diversity, Quality, Thrifty, High level, Specialists, Competition and Collaboration.

Diversity:

Among others, the word diversity covers:

- 'the research areas' by the employee's research within various topics
- 'the tasks of the days' by the employees having various tasks such as supervising, researching, reading and writing
- 'the terms of employment' by the employees having various employments
- 'the age of the people within the building' going from 18 years old for the students to above 80 years old for the Prof. Emeritus
- 'the people in general and their view of the world' having both secretaries in high heels and researchers with old trousers covering the belly button.

These multiple diversities covering various fields are the reason for implementing the word diversity in the mood board of values at DCE.

Quality:

The employees at the DCE are focused on quality instead of quantity both in their job and when spending money. The quality in their job is visible in their focus on developing few, but great applications for the foundation allocating large amounts of money contrary to developing a significant amount of applications for foundations allocating smaller amounts of money. The quality of their way of spending money is visible in for example their furniture. Instead of buying new furniture, the employees prefer their old furniture and once in a while buy furniture with quality – quality as opposed to quantity.

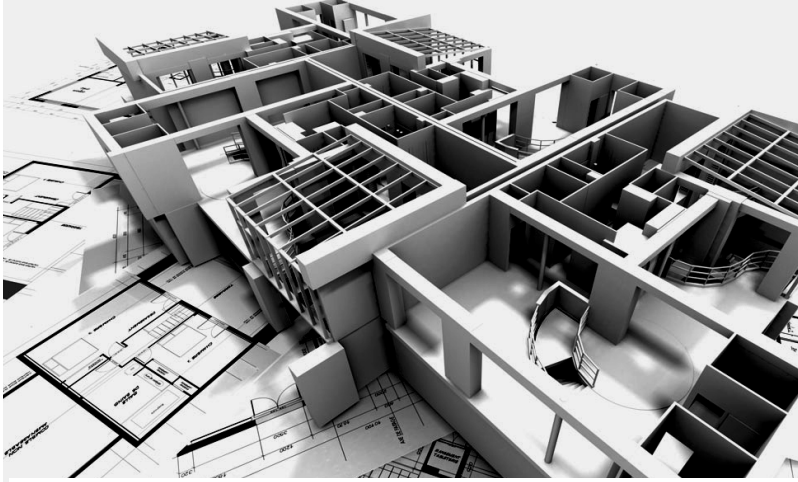
Thrifty:

According to the quality of the physical aspects, the employees are thrifty. They do not spend money on something they do not need, and to a certain extent, they do not ask for more than they cannot get. It was observed that the financial controller begged employees to spend money because the Divisions did not spend as much money as allocated within the budget. The mentality of the Department is that instead of buying new parts and machines they would rather fix the existing parts or build new experiments with old parts. Being thrifty is addressed at the Finance of the Department in total. The DCE is one of the Departments within the FES with the best economy.

High level:

DCE is highly ranked in the world in comparison to Departments researching in engineering at other Universities in the world. The level of the investigation has increased from the year of 2009 until the year of 2016. According to the National Taiwan University Ranking list, DCE was number 127 in 2010 being number 89 in 2015. According to the Academic Rankings of World Universities (ARWU/Shanghai), DCE was number 27 in 2016 out the 500 best Universities in the world (Peterson & Behfar, 2003). Further, the employees are proud of delivering a high level of research which is emphasised in the quality instead of quantity.

Figure 10: Mood board of DCE

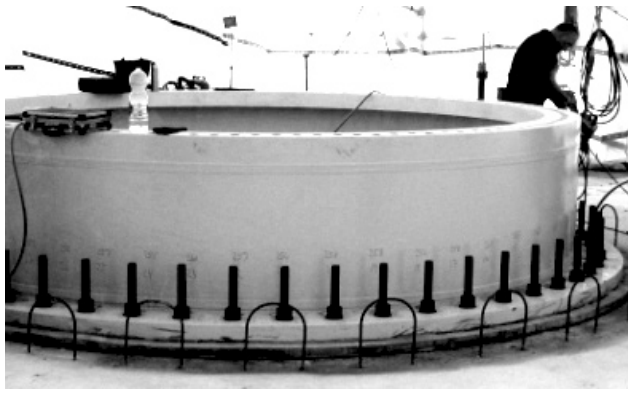


COLLABORATION

HIGH LEVEL

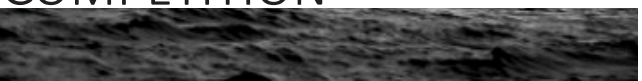
DIVERSITY

QUALITY



SPECIALISTS

COMPETITION



THRIFTY

Specialists:

The majority of the employees at DCE are specialists. They are focused on their research topic, and the quality of the research is carried out at a high level of research. Officially, DCE has numerous researchers chosen to be AAU experts (Aalborg Universitet, 2016b). Being an AAU expert indicates their qualification to express their knowledge to the media about their research area.

Competition:

The University is imbued with the competition. Competition is allocated at all levels in the hierarchy – among Universities, Faculties, Divisions, and Employees. The competition is both according to finances, status and tasks. As in other businesses, the finances are crucial at the University. The University receives money from the Ministry based on both the numbers of students completing their education and the number of papers and projects accepted in acknowledged journals. Further, the University gains money from private fundings for project research, which also includes competition.

Collaboration:

Even though the employees compete, they collaborate. Collaboration is crucial to expand a research topic and additionally apply for large foundations, which is why the majority of the employees at DCE collaborates. Ten years ago, the Head of Department had a strategy of collaboration among the Divisions within the Department because of an extension of the existing research topics and further ensuring foundations for the Department. To force the employees to collaborate, the Head of Department tried to change the culture of the employees by only having a coffee machine in the kitchen instead of one at each office. Thereby, the employees had to leave their office to get a cup of coffee. At the coffee machine, the employees meet each other which articulated the connections among the employees and further the collaboration. Moreover, the Head of Department introduced a coffee break at 10 o'clock every day with bread, cheese and coffee/tea for the employees to have a break and talk to each other over coffee. Simultaneously, this activity articulated collaboration among the employees and the Divisions. The intention was good, and the outcome was positive. Nowadays, the coffee break at 10 o'clock holds at least 50 employees out of 150 employees, and collaboration among the Divisions are implemented in practice.

In general, DCE is a well-functioned place of employment. The atmosphere is great, and new people feel welcome within the Department. People have the intention of complaining about the everyday life, but the level of complaints concerns minor problems such as furniture, bread, coffee and the system outside of the Department, which indicates, that the general aspects of the Department are workable. In general, the employees at DCE are friendly and helpful, and the Department seems like a unit.

Figure 11: Pictures of the end-users at DCE

LOCATION OF AALBORG UNIVERSITY

Aalborg University is situated in three cities of Denmark: Aalborg, Copenhagen and Esbjerg (Figure 12). Aalborg is the main Campus with a scope of 15,000 students, Copenhagen the second largest with a scope of 3,500 students and Esbjerg the smallest with a scope of 700 students (Aalborg Universitet, 2016a).

Aalborg University in Aalborg has various locations in the city, although the main campus is situated in Aalborg East, next to the highway (Figure 13). In 2015, Aalborg University had a building stock of 288,260 square meters in total (Danske Universiteter, 2015).

Figure 12: Map of the sites of Aalborg University

Figure 13: Map of sites of Aalborg University in Aalborg


Midtbyen
Østre Allé
Sohngårdsholmsvej
Langag
Alfred Nobels Vej

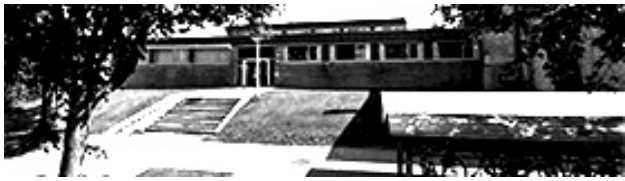
EXISTING BUILDINGS

Previously, DCE was situated at Sohngårdsholsmvej 57 in Aalborg (Figure 14). The main building stock was built in 1963 with yellow bricks, and a built-up roof covered by roofing felt (Aalborg Kommune BBR myndigheden, 2016). The building stock covered several buildings connected by glass corridors. The building stock covered 11,782 square meters for both a canteen, students' offices, employees' offices and laboratories (BBR, 2016; Aalborg Kommune BBR myndigheden, 2016).

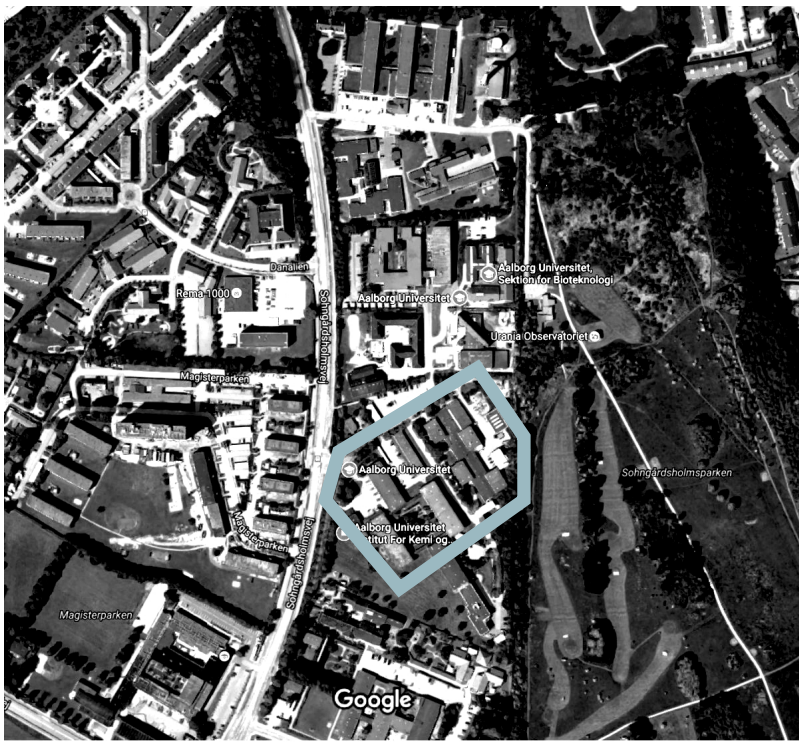
The buildings were characterised by a wide corridor centralised in the building with offices connected to the corridor on both sides. The offices were deep, resulting in the inefficient usability of square meters.

The Department was situated in these buildings for over 25 years.

Figure 14: Pictures of the building at Sohngårdsholmsvej 57 in Aalborg




PARTICIPANTS WANTED FOR
INNOVATION WORKSHOP
WOFIE.AAU.DK
AALBORG UNIVERSITET


Danallen
Rema 1000
Aalborg Universitet,
Sektion for Bioteknologi
Aalborg Universitet
Urania Observatoriet
Magisterparken
Aalborg Universitet
Aalborg Universitet,
Magisterparken
Google

NEW SITE: CAMPUS EAST AND WEST

Aalborg University was established in Aalborg in 1974. The University was planned at an unbuilt lot in between Aalborg East and Sdr. Tranders. The University was planned as an 'External University' (Appendix 1) outside the city. However, the site contained no student accommodation. Contrary to the name 'External University', it was called 'Campus'. In the meantime, while building the buildings for Aalborg University, the University rented buildings in the centre of Aalborg to start-up the University, as the 'Institutional University' (Appendix 1). When the buildings were occupational, the University moved to the Campus area and kept some building stocks in the centre of Aalborg.

In the late 1990s, the university needed a new strategy according to, among other things, the increase in the number of students. The new strategy of Aalborg University in Aalborg involved combining the External University by the existing building stocks in Aalborg East, and the City University of new buildings within the city of Aalborg (Figure 15). The External University was called Campus Aalborg East, and the City University was called Campus Aalborg City.

To collect all Departments at the Campus Aalborg East and Campus Aalborg City, new buildings had to be built. A new master plan for Campus Aalborg East was developed and won by the Danish architectural company Kjaer & Richter in the year 2000. The master plan was based on the first master plan from 1974 by Dall and Lindhardsen (Figure 16). The conceptual framework of the first master plan was to collect the University within a small area, but to keep the connection to the society and to create a vibrant environment in between the building stocks.

The new master plan by Kjaer & Richter in 2000 proposed solving the difficulties of the infrastructural orientation at the existing Campus Aalborg East by introducing the 'Bybånd' from the east-end to the west-end of Campus Aalborg East (Figure 17). The new buildings were planned to connect to the 'Bybånd' to develop a connection between the science and the society. In the clash between the 'Bybånd' and the existing lake and the site of the canteen of the University, a centre of Campus Aalborg East, would be developed to make a landmark of the area. Moreover, a new site in the west-end of the Universi-

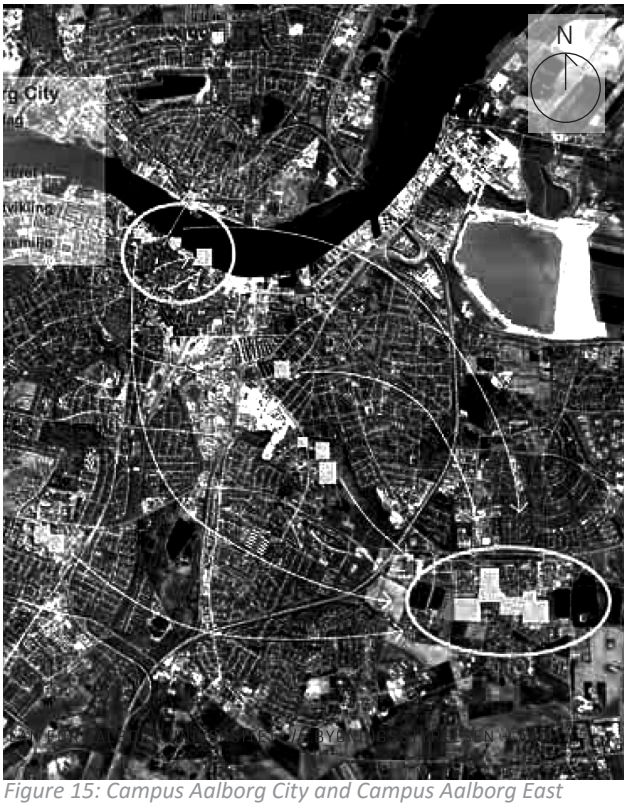


Figure 15: Campus Aalborg City and Campus Aalborg East

Figure 16: Master plan from 1974 by Dall and Lindhardsen

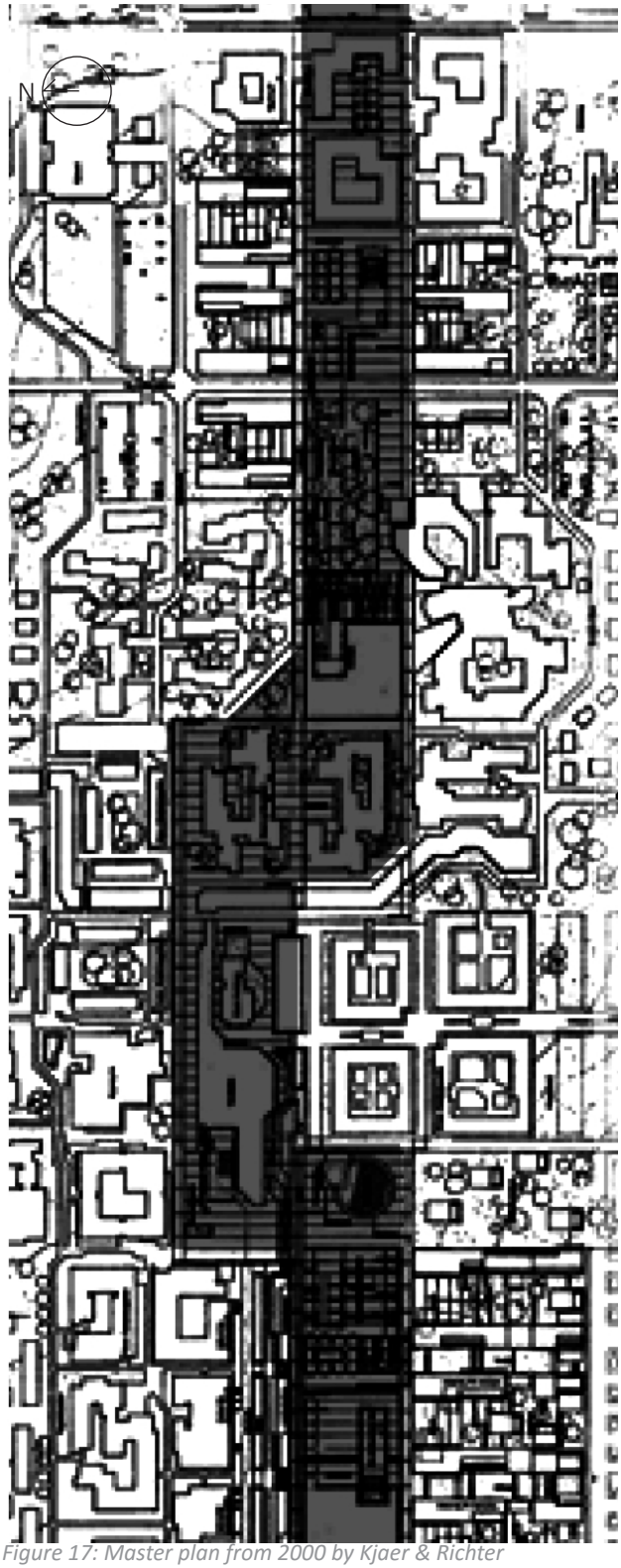


Figure 17: Master plan from 2000 by Kjaer & Richter

ty was developed to implement the Departments of the University that have been situated outside Campus Aalborg East. One of the buildings was allocated DCE.

In 2015, it was necessary to rethink the master plan of Kjaer & Richter because of new strategies within the context of Campus Aalborg East. There were four new aspects:

- Light rail trains going through the University site
- A super hospital in connection to the University
- A competition of a development of Aalborg East called 'In Between' won by Vandkunsten
- Acknowledgement of the fact that the vision of the master plan from 1974 had failed according to implementing the society in the University. The new master plan 2015-2021 focused on the implementation of non-University activities such as residents, shops, restaurants, hotels, schools, which have to be driven individually by organisations outside the University (Bygningsstyrelsen & Aalborg Universitet, 2015).

In general, the new principles of Campus Aalborg East are (Bygningsstyrelsen & Aalborg Universitet, 2015):

- 'Bybåndet'
- Compression
- Meeting spots
- Connections
- Parking in the periphery

At the west end of Campus Aalborg East, the new master plan contained new buildings for DCE, Department of Planning, Department of Learning and Philosophy, extra group rooms and the administration and rector's office (Bygningsstyrelsen & Aalborg Universitet, 2015).

REASONS FOR MOVING

There were multiple reasons for moving DCE to a new location. Some reasons are listed below.

Two Campuses in Aalborg

The intention of collecting the University in two areas (four areas when considering Esbjerg and Copenhagen as well) was to make a stronger relationship between the various Departments and Faculties so as to create a holistic University (Bygningsstyrelsen & Aalborg Universitet, 2015).

Money for the Faculty

The policy at the FES was to spend as few amounts of money as possible on rent and further allocate money on research. At Sohngårdsholmsvej, numerous of square meters were allocated aisle and offices. Additionally, the offices were too deep for practical furnishing. By moving into a new building conducting a smaller amount of common areas and a reduction of the size of the offices, the renting budget decreased for the Faculty.

Change of old working procedure

By moving to a new place, the potential for a change of old working procedures occurred due to the fact of new spaces. While positive aspects of changes in working procedures occurred, there was additionally the risk of multiple end-users unsatisfied by the place of working.

New building for the same amount of money

Caused by both a joint of Divisions and Departments and several agreements within the Faculty, every Departments within the Faculty paid the same rent despite the facts that they were situated in either new or old buildings, or either having numerous or few common areas in the specific building. By moving to a new building, the specific Department had the opportunity to improve their facilities for the same amount of money spent on rent.

Sustainability of the building stock

The buildings at Sohngårdsholmsvej were constructed in 1963, which is why the energy consumption did not fulfil the demands of 2010 and the future. By moving into a new building, the operation saved money on energy use, and further, the new building was better for the environment.

Maintenance

A new building requires less maintenance than an old building, which is why money was saved on maintenance within reasent-years period compared to constantly renovating the existing, old building.

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DELAYS OF RESPONSES

The design of me was initiated and additionally was the meetings. On an organisational level, the building owner had decided to cope with three types of meetings: User group meetings, building owner meetings and steering group meetings. The main difference between the user group meetings and the building owner meetings was the exclusion of the end-users at the building owner meetings, where the subject of 'economy' was implemented. The steering group meeting was determined as the leaders of the groups of participants for them to ensure progression in the project. However, in reality, the aim of the steering group meetings was to approve the project at the end of each phase. The user group meetings were repeated every Tuesday with two weeks in-between giving time for the advisory group to design me, based on the inputs of the end-users and the requirements of the building owner. At the user group meetings, primarily the architects presented bits and pieces of me on a conceptual level. They had a conceptual idea about how to arrange the inner pieces of me in relation to what they called a cleft dividing my volume into two. The cleft would further bring light into the inner spaces of my volume. Based on these ideas, the advisory group had multiple questions for the end-users for further development of my design according to their feedback. The reason for the approach towards the end-users was based on the end-users' future occupancy of me to make me alive. The end-users represented at the user-group meeting sporadically represented the end-user groups of the Department, which is which is why they were unable to make decisions prior to both confronting their colleagues and looking at the drawings of me in detail. Consequently, the advisory group was unable to continue the design of me prior to the receiving of the responses from the end-users. One of the challenges of the end-users was that they commented on me in their spare time. They were not allocated time or money for participating in the commenting, like the rest of the participants at the meetings, such as building owner and advisory group. However, the end-users of the Department were very excited about the new building, which is why the majority of the end-users spent hours on commenting on me to make the flow of my spaces fit their working day and tasks. Another challenge occurred when the end-users who participated at the user-group meetings had to meet with their colleagues to receive the comments, for further delivering information to the advisory group. Due to a lack of organisation, this procedure took two weeks for the end-users to deliver the feedback at the forthcoming user group meeting. To complicate the process even further, the building owner and the tenant of the University demanded a review process of the comments prior to the delivery to the advisory group. This extra procedure was ensurement of a minimum amount of wishes and requirements influencing the budget, the political agenda and the general procedure of public buildings. Each organisation required 1-2 weeks to review the comments, which is why the advisory group received the comments 4-6 weeks subsequent to the questions. Because of the intended schedule, the advisory group was forced to keep on designing me without the comments. This process resulted in multiple redesigns of me to fulfil the comments from the participants, caused by the delays. The multiple redesigns conducted significant amounts of frustrations among the participants, which is why the mood was tense among the participants. The tense mood did not progress the design of me. In fact, it resulted in the directly opposite. Multiple meetings were held without major changes to my design, causing frustrations for all participants of the meetings.

The late comments and related lack of implementation of comments caused rejection of the design proposal multiple times. This was the first push to get me off track.

To be continued at page 50...

PARTICIPANTS OF THE MEETINGS

One of the unique aspects of a public University building project is the multiple users and the related variety of agendas. The involved participants are illustrated in the official hierarchy of the participants in Figure 18. At the first meeting of the Programming and dispositional proposal phase, the building owner presented a similar official hierarchy.

The official hierarchy of the participants is illustrated by the end-users at the bottom of the hierarchy. The end-users are the actors occupying the building along with the Head of Department being the next level in the hierarchy. The Head of Department refers to the level above, being the Faculty at the University, who refers to the tenant. Lastly, the tenant refers to the building owner at the top of the hierarchy, who makes the final decisions according to the building project. The tenant, and the users below the tenant in the hierarchy, rent the buildings from the building owner. The building owner refers to the advisory group, which involves both the client consultation and the design of the building.

In practice, a realignment of the official hierarchy occurred. The building owner, who was officially at the top of the hierarchy, rapidly became the participant only referring to the budget of the building project, such as the maximum amount of money per square meter, without an opinion on the functionality and the architectural aspects of the building. The tenant adopted the top position of the hierarchy by being in control of the meetings and imposing their agenda. The tenant's agenda was first to develop a building fulfilling the demands of the maintenance staff such as electronic systems fitting their existing systems for heating, cooling and ventilation and secondly to develop a building fulfilling the demands of the users. Of this reason, the actualized hierarchy has the tenant in the top and secondly the advisory group, the building owner and the users, which is illustrated in Figure 19.

From the perspective of the maintenance of the finalised building, the actualized hierarchy was optimal, because their requirements were imposed from the initiation of the project. This caused an early implementation of maintenance requirements such as a digital system to control the energy, maintenance-free materials and a limitation of glass according to the window cleaner. From the perspective

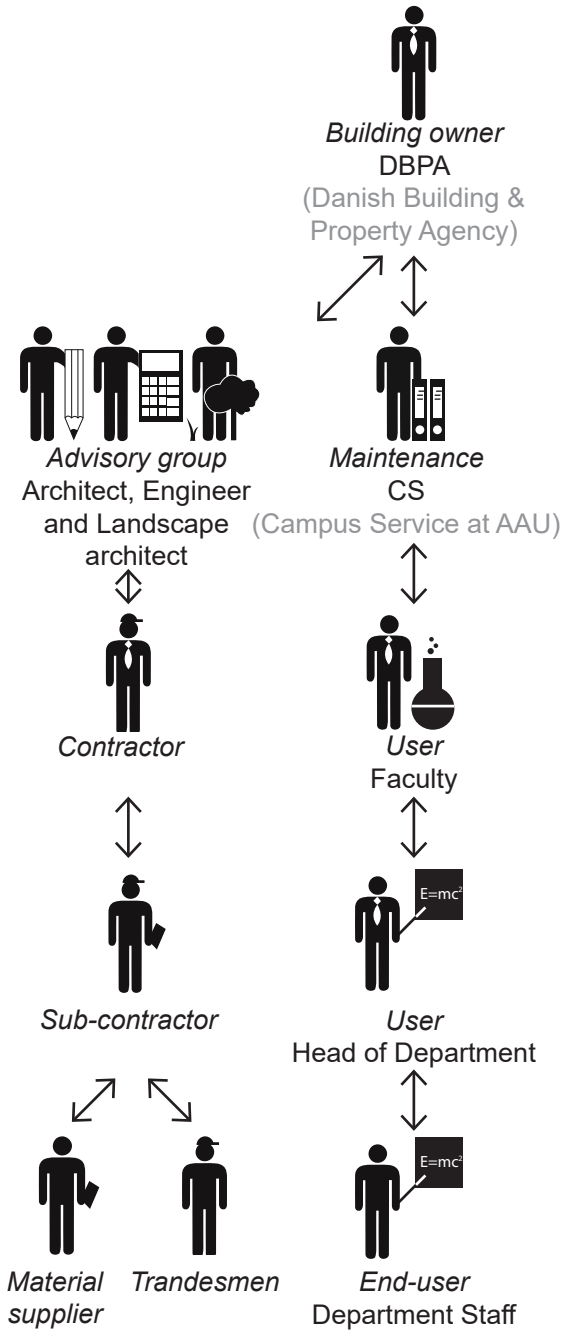

Figure 18: Official hierarchy of the participants in the programming and disposition proposal

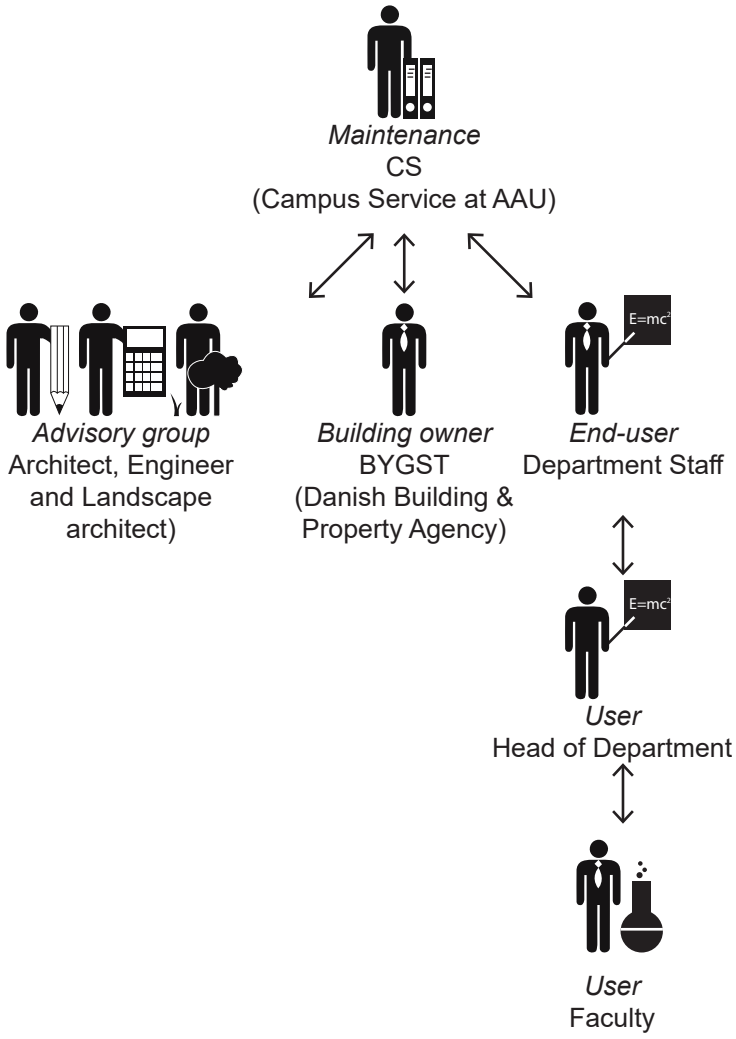

Figure 19: Actualized hierarchy

of the building owner, the actualized hierarchy was workable, because the agenda of the building owner was to build a rentable building for the University, for the building owner to receive money based on rent. The building owner was never going to occupy or maintain the building caused by a distribution of the tasks of maintaining the building stocks to the tenant. For this reason, the actual functions and specific details were uninteresting for the building owner. Their only interest in the Programming and disposition proposal phase was to keep the budget confirmed collaboratively by both the building owner and tenant, to ensure the payment of rent.

From the user perspective, the actualized hierarchy was inappropriate, because of the gap between the advisory group and the users caused by the link through the tenants. Thus, the optimal hierarchy from the user perspective is the user in top closely related to the advisory group, with the tenant and the building owner secondary. The negative aspect of the optimal hierarchy from the user perspective is the potential of exceeded estimates because the users are unprofessional within the building industry and focus on their own demands without being holistic.

In the opinion of the researcher, a flat hierarchy is more useful for a Programming and disposition proposal phase for a public University building (Figure 4). The argument is that the gain of the flat hierarchy is the integration of various agendas resulting in a holistic building.

The flat hierarchy is illustrated as a circle referring to a continuous flow of information among the participants. However, the position of the participants within the circle refers to the closest connection, e.g. the building owner has the closest relations to the tenant of contractual issues according to both internal and external maintenance of the building and to the end-user due to the fact that the needs and requirements of the end-user influence the final design of the building. The other relations are added to Figure 21.

The advisory group is situated in the middle of the hierarchy because they fulfil the requirements of the participants, which is why they are connected to all participants. Moreover, the advisory group is the only participants receiving money contrary to paying.

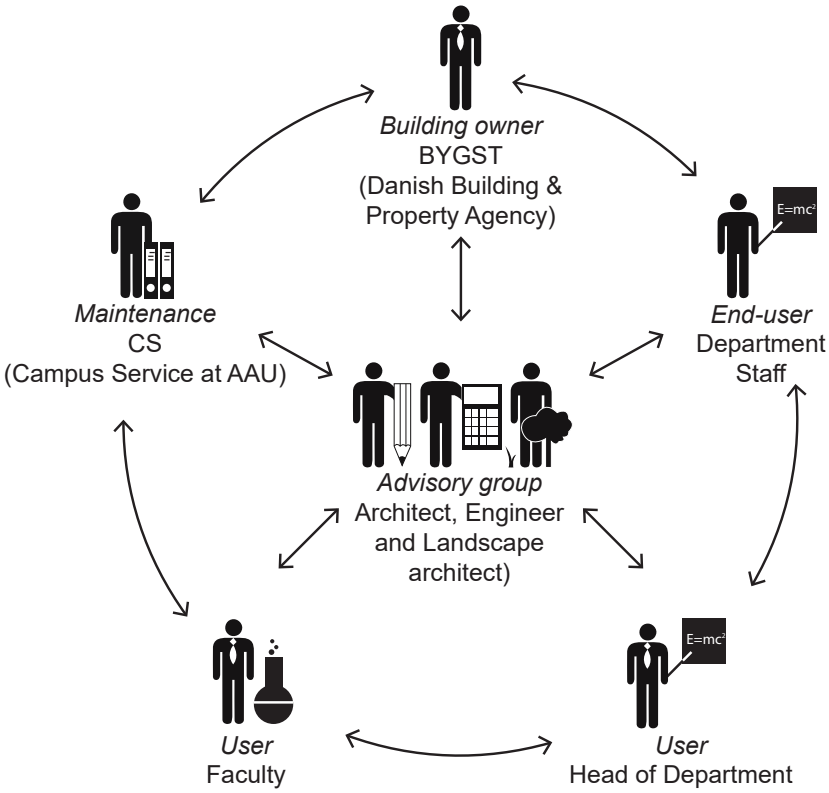

Figure 20: Flat hierarchy – A more useful hierarchy according to the researcher

Participant	Relation 1	Reason	Relation 2	Reason
Building owner	Tenant	Contracts according to both internal and external maintenance of the building officially owned by the building owner	End-user	The needs and requirements of the end-user influence the final design of the building
End-user	Building owner	Persuade the building owner to fulfil the needs and demands of the end-user	User (Head of Department)	Head of Department develops the future strategy of the Department
User (Head of Department)	End-user	Wants the end-users to have the best facilities to fulfil their job assignments	User (Faculty)	The Faculty has the financial responsibility of the Department
User (Faculty)	User (Head of Department)	Delivering a building supporting the research of the Department	**Tenant**	Rents the building through the maintenance
Tenant	User (Faculty)	Receives money in rent from the Faculty	Building owner	Persuade the building owner to fulfil the needs and demands of the maintenance and Faculty

Figure 21: Closest connection for the participants

AMOUNT OF ACTORS

Generalised in the Programming and disposition proposal, this hierarchy covers 18 actors directly involved in this building project which is illustrated in Figure 22. The term 'directly involved' refers to the actors attending the majority of the user group meetings. Some meetings captured additional actors related to the involved participants such as engineering specialist in energy and ventilation, architectural specialists in BIM and maintenance specialists in electricity and outdoor spaces. These additionally actors are not illustrated in Figure 22 because they were not active throughout the entire phase. The total amount of people sporadically involved at the user group meetings in the Programming and disposition proposal phase is 32.

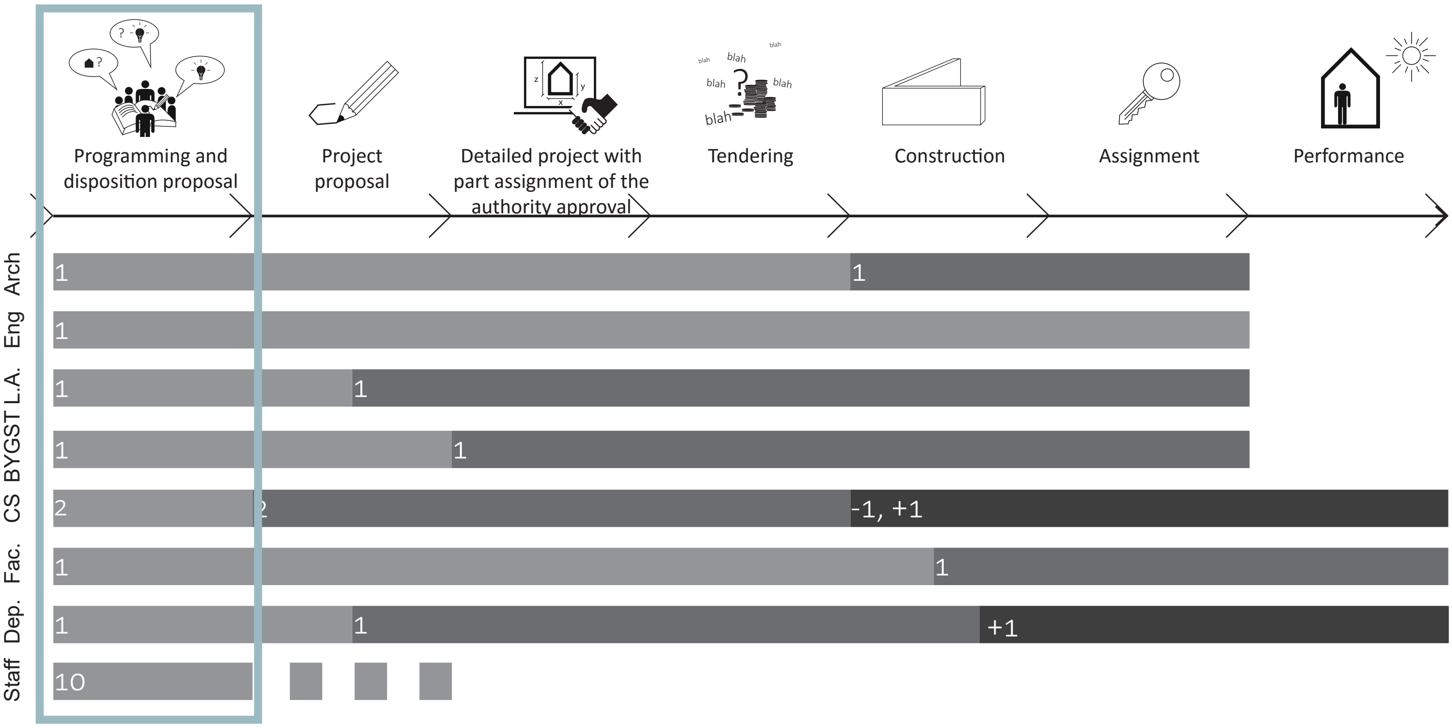

Figure 22: Participants and actors directly involved in the programming and disposition proposa.

TYPES OF MEETINGS

Within the process of the new building for DCE, there were five types of meetings: User group meetings, Building owner meetings, Technical meetings, Steering group meetings and Informal meetings. Figure 24 illustrates the involved participants at each type of meeting.

The amount of participants involved at the meetings varied. The engineer, building owner, and tenant were involved in all meetings, while the architect, faculty, department and employees participated in some meetings. The employees were the participants involved in fewest meetings. As Appendix 2 illustrates, the meetings within the design process took a total of 141.5 hours and by multiplying the hours of the individual involved actors, this calculation results in 1582.5 hours spent in total. The number of actors varied according to the type of meeting involving between 5 and 24 people.

User group meetings

The user group meetings were scheduled every second week in the first two phases of the design process – Programming and dispositional proposal and Project proposal – as illustrated in Figure 25. The user group meetings covered the general aspects and details of the building design, where the employees were a part of the meeting along with the rest of the team, as illustrated in Figure 24.

Building owner meetings

The building owner meetings were in general scheduled every second week subsequent to the user group meeting, as illustrated in Figure 26. In the third phase of the project – the phase of the Detailed project with the part assignment of the authority approval – the building owner meetings acquired the purpose of the user group meetings. The differences

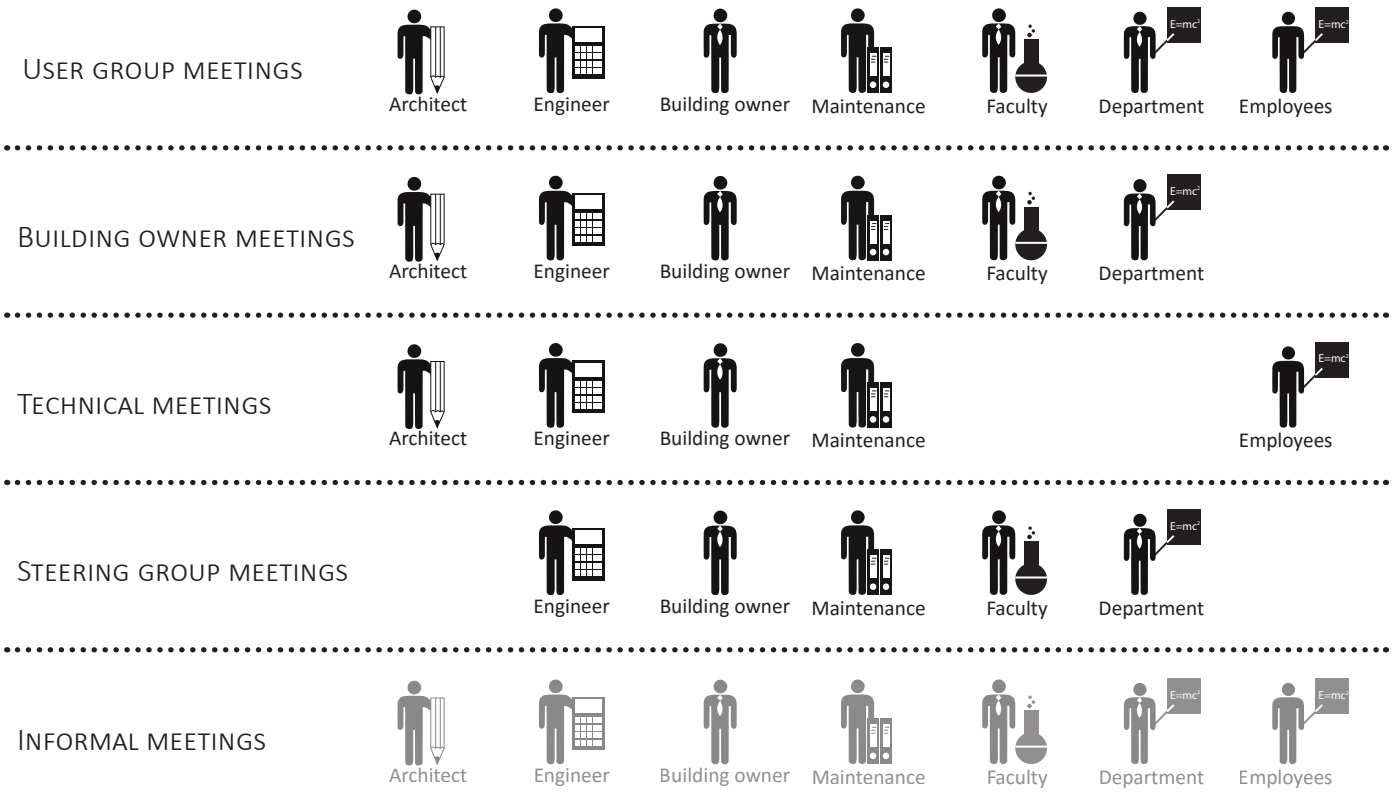

Figure 24: Five types of meetings and the related participants

between the user group meetings and the building owner meetings was the attendance of the employees at the user group meetings (Figure 24) and the content of 'schedule' and 'economy' of the building project involved at the building owner meeting.

Technical meetings

Based on the technical complexity of the building, the user group meetings were inadequate for designing the building to fulfil the specific requirements of the employees at DCE. Technical meetings were arranged with participation guardedly from BYGST and CS, because of insecurity about the employees at DCE involved at the technical meetings implementing new requirements. For this reason, BYGST and CS required attending the technical meeting (Figure 24). The technical meetings were organised by the PhD student, MR. The schedule of the technical meeting was divided into the technical rooms of the building. By dividing the day into the specific rooms of the building, the employees singularly participated when their room was discussed, which improved the efficiency of the meetings. During one day, it was possible to cover the majority of the technical rooms within the building, covering approximately 4,000 square meters.

Steering group meetings

The steering group meetings took place at the end of a phase while shifting to the next phase (Figure 25). The steering group meetings were attended by the leaders of the various participants involved in the building project. The employees did not attending. The steering group was responsible for solving potentially large problems within the project and approving new schedules (Bygningsstyrelsen 2013).

Informal meeting

Outside the official meetings having an agenda and subsequently official minutes, the informal meeting occurred among the participants. The informal meetings occurred at the aisles, subsequent to official meetings, and over the phone. Despite the impossible action of tracking the informal meetings for the unattending participants, the informal meetings had a large impact on the project caused by the fact that some participants and actors knew more about the details of the project than others. In some cases, the informal meetings resulted in parts of the project being fulfilled more easily than waiting for the next meeting and debating the pros and cons of the idea.

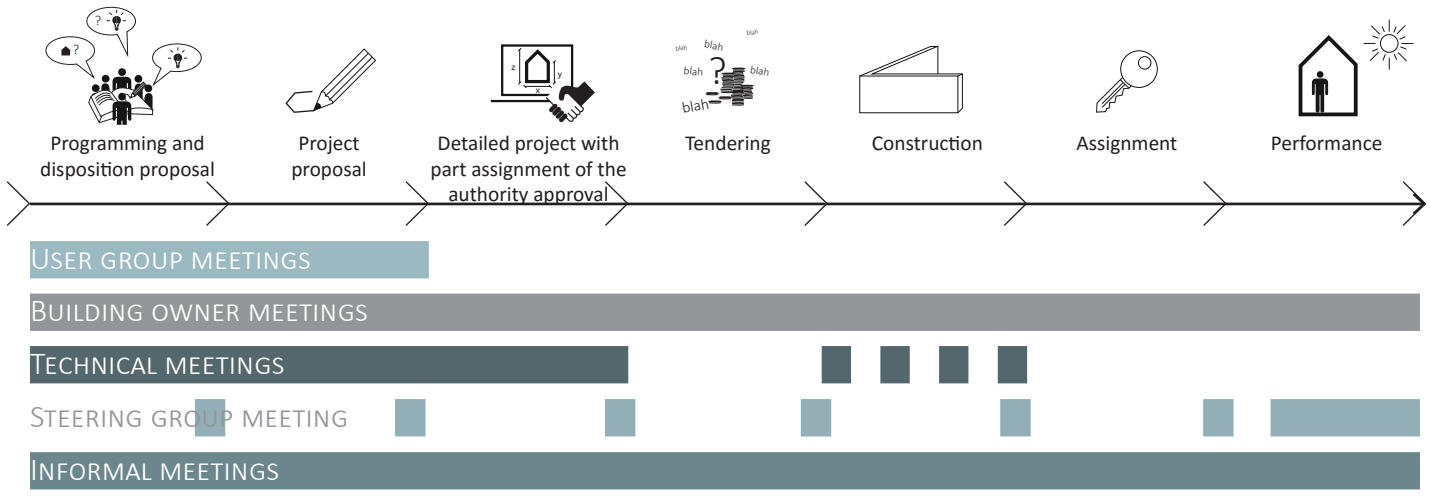

Figure 25: Types of meetings within the various phases

DURATION OF THE MEETINGS

In general, the meetings were arranged every second week. The user group meetings were often scheduled in the mornings for 2.5 hours with an additional building owner meeting in the afternoon for at least one hour. After the first two phases, the user group meetings ended, and the building owner meetings expanded in time with a duration of at least three hours (Figure 25 and Figure 26). The building owner meetings were scheduled from 11 o'clock because of participants from BYGST flying from Copenhagen to Aalborg. Additionally, in the phase of construction, the participants from BYGST had time for investigating the building site prior to the building owner meeting.

The 'other meetings' illustrated in Figure 26 indicate technical meetings, steering group meetings and a workshop.

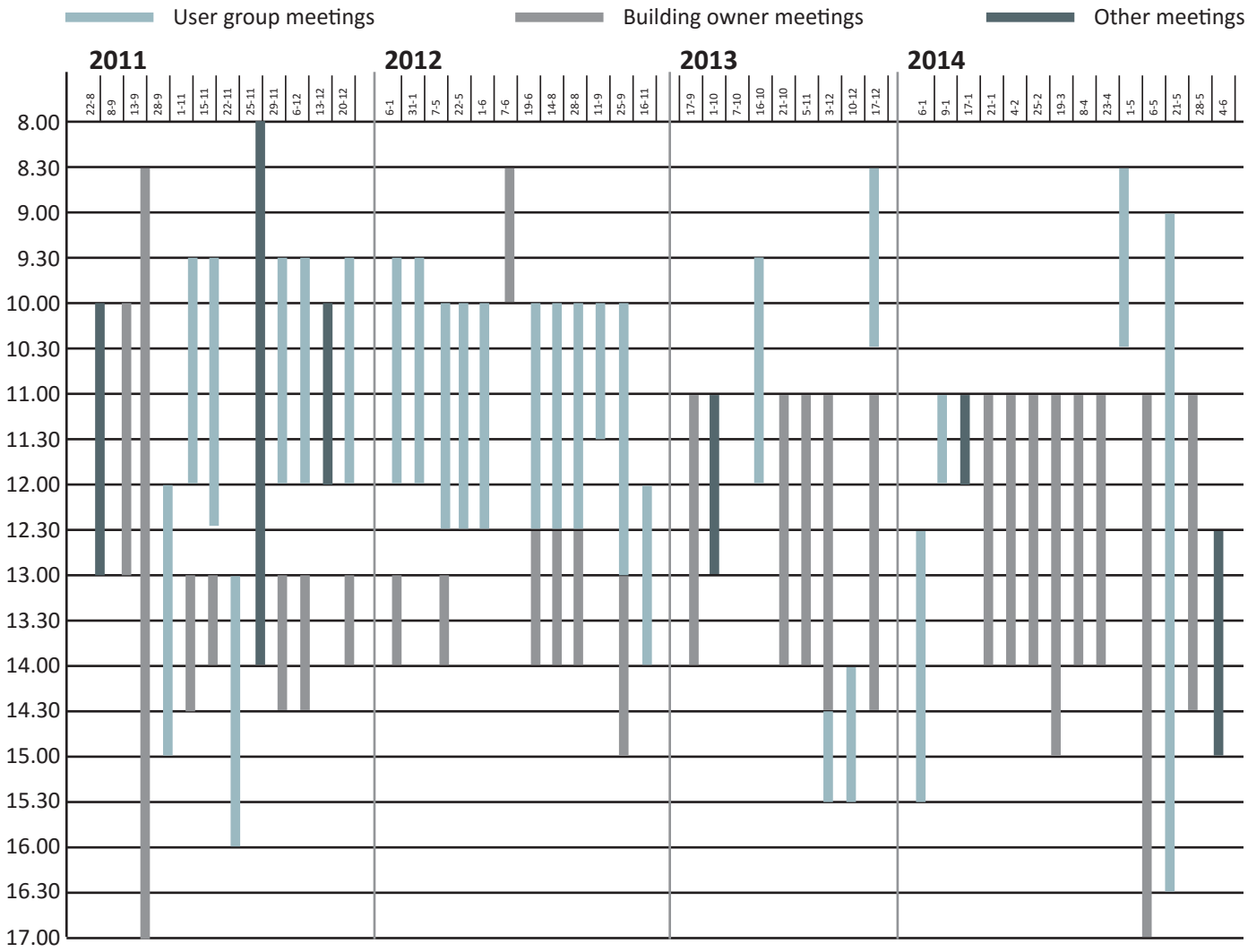

Figure 26: Duration of meetings

STRUCTURE OF THE MEETINGS

The meetings were situated in the buildings of CS at Campus East in a meeting room. Within the room, the actors sat around a long table with a projector at the short end of the table to present digital slides and a whiteboard to write ideas and conclusions. At the second meeting, all actors had an unofficial private seat, which lasted throughout the building process.

The engineer was the keeper of the minutes on behalf of the building owner. Subsequent to the meetings, the minutes were uploaded to a web database called Byggeweb, for all actors to access the minutes. The agendas of the meetings were similar at every meeting, but the content of the heading within the agenda varied at each meeting according to the stage of the project.

The purpose of the meetings was to clarify the stage of the project and to answer questions of the participants. At the meetings, certain questions from the participants were unable to be answered because the base of support of the participants had to answer the question. For this reason, a procedure of feedback was developed for the process (Figure 27).

The procedure of feedback was initiated at the meeting every second Tuesday. The advisory group asked questions for the end-users to be answered by their colleagues at the Department. The participants of the Department brought back the questions for the colleagues to answer within topic groups. Internally at DCE, 12 topic groups were developed based on categories of various themes to be discussed in relation to the new building. The 12 topic groups covered: 1. Offices, 2. Teaching, 3. Students, 4. Laboratories, 5. Living Lab, 6. Working environment and security, 7. IT and technology, 8. Art, 9. Moving, 10. The collecting group, 11. Façades, 12. FoodLab. The topic group meetings were arranged according to the calendar of the actors involved in the topic group meetings within the following 1.5 week. By making these topic groups, the wishes and requirements of the employees were passed on to the advisory group.

MR and another researcher met with the different topic groups and noted the answers of the employees in schemes within Microsoft Word documents describing theme, wishes and status. The schemes were accepted by a collecting group containing the Head of DCE, a representative from FES, a head of division and the two researchers. This meeting took place

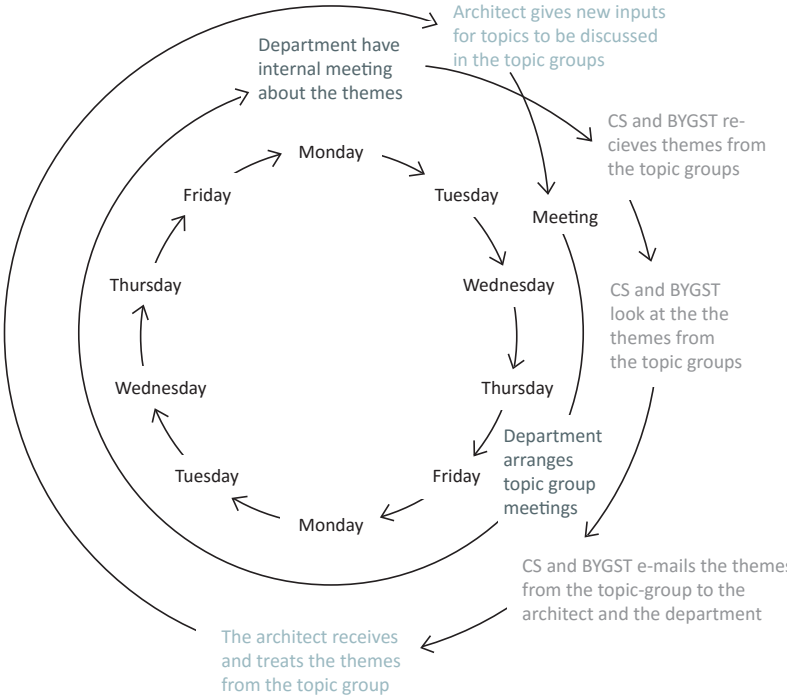

Figure 27: First procedure of feedback within the process

every second Monday, the day before the meeting. The collecting group discussed whether or not the wishes of the topic groups were acceptable for the building, the future working strategy and the economy. Further, the result of each wish was added in the column 'Status' with 'OK' highlighted by green and a 'NO' highlighted by red with a remark about, which is why this was not accepted. The sheets were delivered to the end-user's colleagues by the intranet, and the sheets were adjusted for the BYGST and CS only to receive the wishes and demands having an OK. BYGST and CS approved the requirements prior to the delivery of the sheets to the advisory group. Later in the process, the topic groups received drawings from the advisory group, where the comments were added to the drawings instead of the schemes.

On Monday, approximately three weeks after the question was asked, the advisory group received the feedback (Figure 27). At this time, the advisory group worked on the third iteration of the building project, which is, which is why the answer was useless.

This procedure was inefficient, so a new procedure was presented by the Department. The new procedure covered two weeks instead of three weeks, c.f. Figure 28.

Similarly to the first procedure, the new procedure of feedback initiated at the meetings every second Tuesday. Like previous procedures, the advisory group asked questions for the end-users to answer by their colleagues at the Department. Instead of having topic group meetings for two weeks, the Department squeezed the process by one week having the topic group meetings scheduled for Wednesday and Thursday. On Friday, the collecting group at the Department had internal meetings. The conclusion of this meeting was received by BYGST and CS on the following Monday, from when they had one week to accept or reject the answers and the additional themes. On Friday, BYGST and CS delivered the accepted answers and additional themes to the advisory group and the Department. Thereby, the advisory group had one day to adapt the answers and additional themes for the meeting on the following day, Tuesday.

Neither this procedure was perfect because the advisory group worked on the second iteration without receiving the answers from the Department.

The reason for the length of the procedure was due to the money flow of the organisation. Every participant had money involved in the project, which is why they required being a part of the project in order to keep the budget.

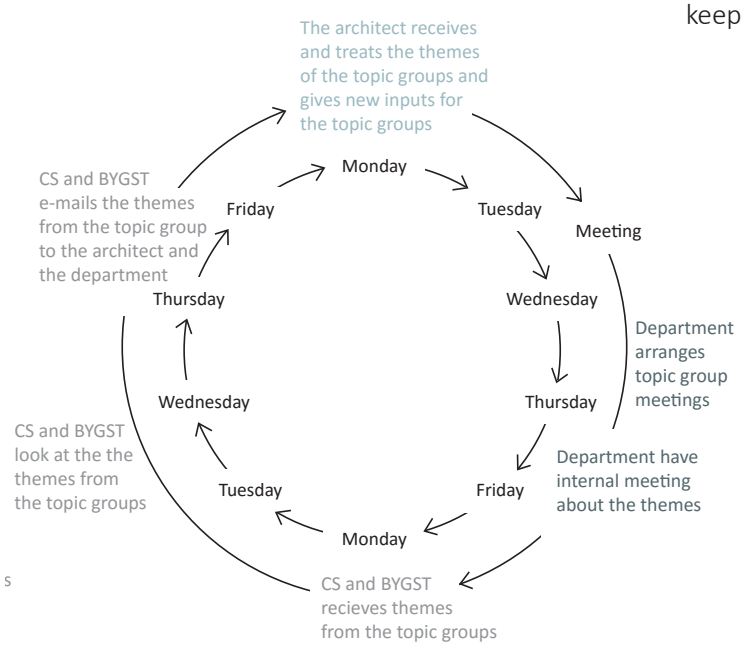

Figure 28: Second procedure of feedback within the process

REJECTIONS

The intended schedule of this project is illustrated in Figure 29. According to the intended schedule, the project initiated in August 2011 and ended in July 2014.

The intended schedule did not succeed, which is why the schedule changed. The realised schedule (Figure 29) had the starting point of the project in August 2011, while the finalisation of the project was incompleted in the summer of 2017. The realised schedule was developed based on multiple schedules changed during the project. The dates in the realised schedule are the actual dates when the activity occured.

Intended + realised schedule

The first activity of the intended schedule caused changes in the intended schedule due to delay. Instead of handling in the program and disposition proposalon December 16, 2011, the advisory group handled in the program and disposition proposalon January 18, 2012 (Figure 29).

The delay of the first activity caused delays in the following activities, which is why the intended schedule was delayed. After multiple changes of the schedule according to the delay of the activities, the intended schedule was extended by three years.

More activities were added to the schedule such as rejections and approval of the project, periods of no work, building permission and competitive bidding.

Reasons for the changes

The extension of the schedule was caused by three rejections of the project, and the causative pauses in the process based on the rejections (Figure 29).

The first rejection was February 7, 2012, when the first program and disposition proposal was rejected. Subsequent to the rejection, the project had a period of no work on the project until May 5, 2012, when the first user group meeting took place after the rejection. May 29, 2012, the second program and disposition proposal was submitted, and further, it was approved on July 30, 2012.

November 16, 2012, the project proposal was rejected, and a revised project proposal was submitted November 23, 2012.

A new period of no work at the project was performed until September 17, 2013, when the project was resumed.

February 10, 2014, the advisory group received the building permission, and April 23, 2014 five entrepreneurs were prequalified to attend the tendering of the project. Despite this, the main project was rejected on May 5, 2014, and July 3, 2014, the tender of the project was initiated.

October 1, 2014 was the day for the result of the tendering, and the construction of the building was initiated November 21, 2014.

At January 14, 2015, the budget was changed.

September 28, 2015 the topping-out ceremony took place.

The legal submission of the building, the AB92 submission, took place four times where the building was rejected three times i.e. June 6, June 20 and July 8, 2016. On July 15, 2016, the AB92 submission was accepted by the building owner and the DCE moved into three floors of the building (first, second and third floor) on August 12, 2016. The basement, the ground floor, and the rooftop are not submitted in 2017, which is why it is impossible to move into these areas.

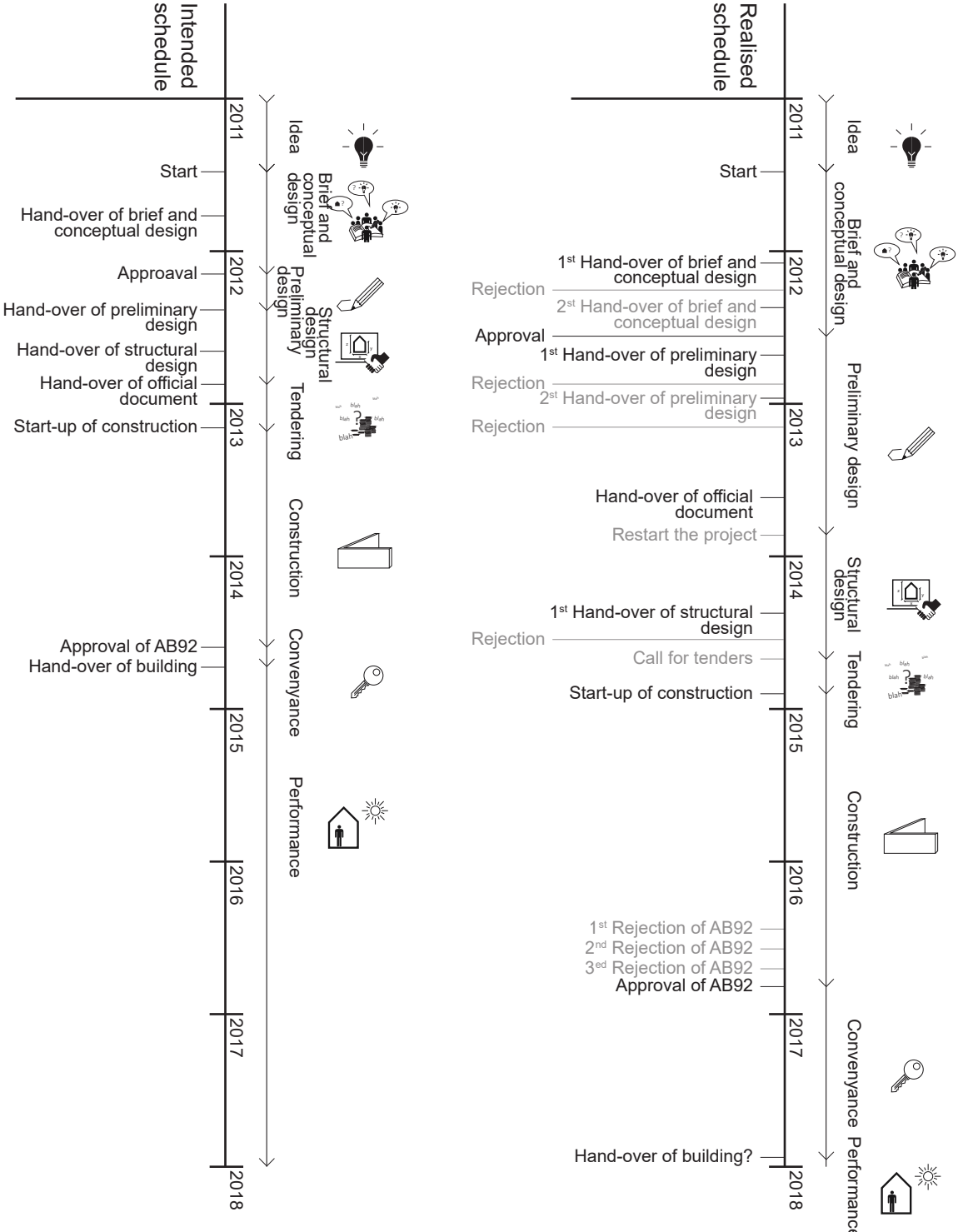

Figure 29: Intended and realised schedule including the related phases of the project

Consequences of the changes

The changes to the intended schedule had consequence in aspects related to the project. This scheme (Figure 30) identifies the consequences for each participant group of the design phase of the project.

Participant group	Consequence
End-user – DCE	• Bad reputation: "Department of Civil Engineering cannot manage constructing buildings." • Pre-arranged hiring out of the new laboratory facilities fails • Research is not possible because of lack of laboratory facilities • Terminate a tenancy of existing buildings makes the Department homeless • The budgets of the year include the cost of the relocation of the Department. The absence of moving into the new building causes changes in the budgets influencing the budget of the coming year • Current students cannot get the same education as the previous students, because of lack of laboratory facilities
Tenant – Aalborg University	• The budgets of the year include the cost of the relocation of the Department. The absence of moving into the new building causes changes in the budgets influencing the budget of the coming year • The total budget of the building increases because of potential increase in the fee for the advisory group because of extension of the schedule
Building owner – BYGST	• The interest rate on mortgage loans has to be paid during a longer period because the building is not finished in time according to the intended schedule making the project more expensive • 80% of the projects has to be completed in time to get a bonus from the Ministry (Bygningsstyrelsen, 2015)
Advisory group	• The number of hours of the project increases, which is why the people at the project requires more money to finish the project • Potentially receives a larger fee because of extension of time and potentially new demands from the client

Figure 30: The concequenses of the participants of the building project if delays occurs

Figure 31: Picture of some schedules for the building project

Evaluation of the schedule

The intended schedule indicates that the measured and expected project duration was three years (September 2011 to July 2014). As the realised schedule indicates, the actual period lasted more than five years (September 2011 to maybe late 2017).

The first activities of the intended schedule indicate that the phase of the program and disposition proposal should last from August 28, 2011 to December 16, 2011 which is 3.5 months. Within this period, the needs of the owner and users have to be collected and described, and space specifications have to be documented within a space program. Moreover, the architectural idea, general materials, structural principles and the usability of the building have to be described and drawn. These cover a significant amount of information to collect and adapt to a project within 3.5 months when user group meetings are scheduled every second week.

The opinion of the researcher of this report is that the only way to succeed with the intended schedule was by having a strict facilitation of the project and an additional schedule with a high level of detail describing which information to be discussed within and in between the meetings. This is especially important when developing a project with this level of complexity coping with 9,000 square meters involving both laboratories and offices for students and employees.

Moreover, the period of the construction phase increased from the intended schedule to the realised schedule. In the intended schedule, the entrepreneurs had 1.5 year to finish the project (February 2013 to August 2014), while they in the realised schedule used more than two years to finalise the project (November 2014- maybe late 2017). The reason for the increase of the time can be due to the date of initiation of the construction phase. If the activity within the phase does not fit the seasonal weather conditions, an increase of the schedule is necessary.

POLITICAL AGENDAS ATTACK THE PROCESS

Followed by the rejections, the schedules changed. Instead of the intended schedule of my completion in summer 2014, the dates were continuously moved to January 2015, December 2015 and summer 2016. These delays were hard pushes, like two men boxing in a fight. I was far from knocked out, but I was dizzy. However, I believed in my advisory group and building owner to complete me with dignity. The advisory group kept designing me with dignity based on their professions and previous work. However, forces from outside smashed me over my legs, and I had trouble standing. The forces from outside were political agendas from both the Ministry and the University and further the Department. The Ministry changed politicians, which influenced the organisation of the building owner who was a public building owner. New leaders of the building owner organisation changed the structure of the organisation, which is why new actors of the building owner were involved in the project. Previous questions and discussions according to my design with the former actors of the building owner was resumed. I was not in a flow, and the detailed level of my spaces was discussed instead of the organisation of the spaces and the bigger scale.

At the political level of the University, the money for paying rent of me was changed according to previous agreements. Other building projects on the new site where I was going to be situated were declined caused by lack of money. After a while, the board of the University decided to complete me. However, I was going to be the only building in that area. The new site was a field next to the existing Campus, so there were no roads, plumbing or electricity within the area. The previous agenda was to allocate money of the building budgets from every new building at the site to finance the site development, but now that they were postponed as a part of the new site, my budget was the only one from which to allocate money. For this reason, my budget was challenged, which slowed the progression of my design.

Moreover, the Department decided to reduce the focus at the workshop spaces of my volume, due to a challenge of the cost of the working tasks being conducted in external companies in the city. However, this decision was not communicated clearly to the workers who was a part of the end-users at the user group meetings. This miscommunication caused confusion among the workers, because they lacked the spaces within me as they dreamed about. Despite no workers were fired, they were frustrated because they predicted the potential of future job eliminations if I was not designed for fulfilling the working tasks of the workers. This fight continued, and I was frustrated and exhausted as well. I just wanted to be a great building sheltering happy people. I dreamed of being a building for international guests to say “WOW” when they saw me and think of me as a one of a kind. A place they wanted to go to and proudly say: “I am going to the building for the Department of Civil Engineering in Aalborg”, and everybody would be jealous. However, I was now in the middle of political agendas, financial problems and bad building management, which made me sad.

To be continued at page 56...

BASE OF SUPPORT FOR THE PARTICIPANTS

The participants within the process were representatives of the organisations where multiple colleagues additionally had an implicit influence on the project without being present at the meetings.

Building owner

The base of support for the participants of BYGST covered both lawyers at BYGST, the Director at BYGST, and the Minister.

Lawyer

The lawyers of BYGST were interested in the procedure of the design process so as to avoid complaints from other companies according to legal aspects of the procedure. This interest of the lawyer influenced the act of the participants, because they had to act as the lawyer told them to, according to the procedure.

Director

The manager of BYGST was interested in keeping the schedule because BYGST received a bonus if they finished 80% of their buildings within the intended schedule (Bygningsstyrelsen, 2015).

Minister

The Minister was interested in the completion of the building because the amount of new buildings initiated and completed within the period of the existing government was important for statistics of the conductions of the Government within their premiership in Denmark. Moreover, the Minister was interested in the international level of research within the building, because of the profit for Denmark by having a Department in Denmark to be mentioned within international research.

Advisory group

The base of support for the participants of the advisory group covered both colleagues and directors of the organisations.

Colleagues

The colleagues of the organisation of the advisory group were interested in the project because numerous of colleagues worked on the project. When the advisory group returned to their companies, numerous of colleagues worked on parts of the building, such as an electrical engineer, a structural engineer, a finance assistant, a render and an interior designer.

Director

The director of the organisations of the advisory group was interested in the project caused by financial reasons. The director had to ensure that the building budget was kept according to the earnings of the company.

Tenant

The base of support for the participants of CS covered both the colleagues and the director of CS.

Colleagues

The colleagues of the participants of CS were numerous and varied according to the task of employment. The task of employment could be any aspects of the building such as cleaning, maintenance, gardening, energy management, work environment management and BIM management. Every profession had an interest in both the process and the finalised building at various levels.

Director

The director of CS was interested in the process, the finalisation of the building and the occupation of the building. The process was interesting because the director could ensure the fulfilment of the requirements of the employees at CS according to both materials and the flow of the building. The finalisation of the building was interesting because the time was crucial for the rent from the Faculty and the rent of other buildings for the Department before moving into the new building. The occupation was interesting because numerous employees of CS worked with or within the building every day when the building was occupied.

User

The base of support for the participants of the Faculty covered both the University board and other Departments at Aalborg University.

University Board Aalborg University

The University Board was interested in the finalisation of the building, because of media exposure and an increase of students and researchers caused by better research facilities. The media exposure was interesting for the University Board, because of notification both nationally and internationally to attract students, researchers and companies to be a part of Aalborg University. Further, the interests generated a larger fortune. The increase of students and researchers caused by better research facilities was gained by a new building with the best research facilities internationally, which is why the University Board had an interest in the finalisation of the building.

Other Departments at Aalborg University

Other Departments at Faculty of Engineering and Science were interested in the economy and the size of the new building. The economy has an influence on the rent of the other Departments because the rent at Aalborg University is solidary within the Faculty, which means that all Departments share the total amount of rent for all buildings serving the Departments within the specific Faculty. If one building is more expensive than the rest, the rent for all Department will increase.

For the Departments having buildings planned to be situated at the same site as the new building for Department of Civil Engineering, they were interested in the size of the new building. If the new building was larger than planned, the additional square meters of the building were reduced from the buildings for the other Departments within the area. This was because of the total plot ratio, which was limited to the new building area.

Employees at the Department

The other employees not participating in the user group meetings also had a large influence on the building through the topic groups.

INTENTIONS OF THE PARTICIPANTS

Principal-agent-theory

As illustrated in Figure 21, the various participants have different agendas being a part of this building project. Through principal-agent-theory (Birkinshaw & Birkinshaw, 2009; Bøgh Andersen, 2010; Hermansen, 2016), the different agendas are analysed by indicating the principal, impact, agent and incentives. The principal is the participant or actor having an impact indicating the reason why the participant is involved in the building project. An example is the Ministry being the Principal who has the Impact of having a high level of Danish University buildings to improve the export of Danish companies (Figure 23). According to principal-agent-theory, the fulfilment of the impact is depended on the action performed by an agent, who perform the action because there is an Incentive. In relation to the example, the agent is the building owner performing the actions related to finish the building project according to the schedule, because their incentive is that the building owner receives a bonus if 80% of the buildings are finished within the intended schedule (Figure 12). Figure 32 indicates how this impact develops new impacts and incentivies throughout the official hierarchy. Within a building project, there are multiple impacts and incentives. This example is based on money and time.

As Figure 32 indicates, one individual impact of a Participant influences the action of other Participants. Multiple impacts contribute to the activities of a building project, which is why **I believe a coordination of expectation is preferable at the first meeting involving every Participants of the Programming and dispositional proposal phase**. By expressing expectations, all Participants are involved in the agendas of the Participants and a common understanding of each other is initiated.

Principal	**Impact**	**Agent**	**Incentive**
Ministry	High level of buildings for Danish Universities to improve the export of Danish companies	BYGST	Bonus if 80% of the buildings are finished within schedule
BYGST	Finish the buildings within schedule	CS	The rent of the building is the same as expected instead of increased because the building interest rates keep within the budget
CS	Decide early what is required in the building	FES	The rent of the building is the same as expected instead of increased because the building interest rates keep within the budget
FES	Decide early what is required in the building	DCE	The rent of the building is the same as expected instead of increased because the building interest rates keep within the budget
DCE	Decide early what is required in the building	Employees at DCE	Move into a new building with facilities usable for the employees and students

Figure 32: Principal-agent-theory on one aspect of this building project

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THE ELECTRICAL BOARDS

Based on the fact that the Ministry and the University had allocated money for me, I was designed, and the tender was initiated in the summer of 2014.

During the structural phase, the end-users were cut out of the project due to delays of the earlier phases. However, the advisory group recognised the fact that they were unable to organise me properly by leaving out the end-users, because the end-users were the professionals when approaching technical aspects of the specific technical machine to be situated within my volume. Some of the difficult spaces to organise based on the existing knowledge of the advisory group were laboratory spaces such as the water hall. The water hall was significantly technical according to the water basin with specific technical currents of the water and the related machines conducting the currents. This level of technical expertise was uncommon building practice, so the advisory group requested consultancy by the end-user. The meetings concerning these technical aspects were called technical meetings. However, only a few spaces of me were designated to have a significantly high level of technical aspects, which is why the rest of my spaces were designed based on the existing knowledge of the advisory group by leaving out the end-users of the other spaces. This setup progressed the final design of me, and I was ready for the tender. While the majority of the drawings of me were finalised for the construction phase, some drawings were yet uncompleted by the date of the tender.

A team of contractors won the honour of building me. They won based on the lowest cost of the bidding contractors. The tenant of the University was not happy about the choice of contractors, because they had bad experiences of the work and the collaboration of these contractors. However, a lack of information delivery among the building owner and the tenant resulted in the building owner unconscious about these previous experiences, so a rejection of the winning consultants was impossible at this point. The building owner encouraged the tenants to be positive about the contractors and further hope for new project managers of the contractor's company to build me.

The day for the construction of my foundations arose. I could feel the soil and sand under my concrete foundation, and progressively I raised from the ground and became taller. My foundation was cast-in-place and similarly were my shafts for fire escapes, technique and escalators. However, something went wrong and I was already four months delayed subsequent to the completion of the cast-in-place. Despite this delay, the contractor ensured that the four months would be reached within the completion of my other stories, which was scheduled to be nine months and was now reduced to five months. The building owner and the advisory group believed them, and the schedule persisted which resulted in a progression of the construction of my other stories.

While the progression appeared, the end-users were very exited to see me, and they managed to look inside of me during the construction period by official appointments. While doing that, they became aware of major mistakes of the technical organisation of me. They wanted me to be perfect, so they wanted to change the mistakes when seeing them. However, the building owner did not want to change aspects of me during the construction, because the contractor additionally would demand extra cost for the changes, and further, the schedule would extend. For this reason, the end-users were asked to keep silent until the building was ready for inspection for defects when the contractor announced the completion of me. However, the end-user had difficulties understanding the financial logic of doing some major mistakes on purpose caused by the legal implication of the case. An example was an electrical board in my climate hall centralised in my volume. Multiple electrical wirings and cables were assembled in this electrical board, which is why it was expensive and time-consuming to cable the electrical board. In the conceptual phase, the end-users in collaboration with the advisory group, the building owner and the tenant agreed to situate the electrical board under one of my stairs in that hall. However, during the structural phase when the end-users were cut out of the project, the electrical board was removed to be situated at the centre of a wall in the climate hall caused by an expansion of the size of the electrical board during the structural phase. Despite the good intentions of the advisory group, this removing was unacceptable for the use of the wall, because the wall was intended for other purposes. For this reason, the end-users continuously requested the building owner to change the position of the electrical board to other places in the climate hall. The electricians were aware of the conflict among the end-users, the building owner and the advisory group, which is why they postponed the work of setting up the electrical board until the last moments. Time ran on, and the schedule of the electricians came to an end and the electricians could not keep waiting for a decision from the building owner. For this reason, they situated the electrical board at the wall comprehensive to the drawings. This discussion among others continued, resulting in not completing me in other places. In the end, the building owner agreed upon moving the electrical board, so the electricians had to remove it to a third place confirmed in collaboration with the end-users.

These discussions exhausted the workingmen, and I felt that the progression of me was lacking. I was not improved every single day. We were all getting tired.

To be continued at page 62...

EXTRACTION OF DISCUSSED CASES

The things that went wrong were numerous. A faults and deficiency list for three storages out of six contained 2,400 faults and deficiencies covering various sizes of faults and deficiencies.

To mention a few and some of the larger faults and deficiencies, the following chapter describes these. The faults and deficiencies can be divided into office and laboratories.

On the office site, the things that went wrong were the following:

The groups rooms were too big. When the calculations of the areas of the Department were made subsequent to the tendering, the area of the group rooms covered the same amount of square meters as the department had originally, but the amount of rooms were less than what they had originally. This was due to the group rooms were too deep, and so the rooms were too big for the amount of people in a group at the university. For this reason, before the building was built, the employees reorganized the rooms and considered tearing down the walls that were not even built at that time, for the CS to fix the floors and ceilings subsequently to the handover.

According to the offices and group rooms in general, the end-users asked for furnishing plans very early in the process. However, it took ages to get a furnishing plan, and when the time came for the furnishing plans it was impossible to move the walls because the module lines had to be followed. The problem with the furnishing plans was that there were not that many opportunities of furnishing, but the advisory group argued that it was a good way to be seated. When the furniture had to be ordered, the internal interior designer at the University found out that the tables that the advisory group had added to the drawings were 70 cm deep. A standard table, recommended by the working environment rules, is 90 cm. Based on this information there was not much space in the offices in the width of the offices, which is why the furnishing designers had difficulties in furnishing the rooms.

The furniture had to be ordered prior to the handover of the building, in order for the furniture to be finished. The amount of money of the furnishing covered 2.5 million DKK, which is why it was a large amount of furniture to be delivered.

In the building, there was not enough space for storage of the books that the majority of the researchers had originally, so new ideas about how to store the books were organized in cupboards in the aisle. Additionally, spaces were made at the aisle for touchdown spaces and unofficial meetings, which is why there had to be furniture against the walls. However, the drawings did not say where the radiators and acoustical boards were situated, and so some acoustical boards had to be moved when the end-users occupied the building and some sofas had to be situated in front of a radiator contrary to being placed up against the wall. This was not optimal, but necessary to have the touchdown spaces.

As mentioned, the radiators were not drawn in the drawings. In the VVS drawings, pipes w indicated, but the size of the radiator was not indicated in the drawing, but in a catalogue, which was difficult to find and was never found by the internal interior designer. For this reason, surprises were made when seeing the various radiators around the building situated in wired places, because there was a wall for the radiator to be situated. In small blind corridors for a touch down space there were a radiator as big as I have never seen it before which was situated there because it was in connection to the open space, and so it counted for the open space in the calculations, but in practice the small space would be too warm. Additionally it was situated towards south where it was too warm already.

In an effort to save money, a saving round was introduced. In this practice, there were some very wired decisions made, such as saving the sunscreens at the southern and western facade, saving parts of the terraces at the building, saving finishing at the walls of the toilets and laboratories, saving of two ventilation aggregates to be one instead, savings of digital screens at the door and saving of digital lockers at the doors for key lockers.

The saving of the screens towards south and west resulted in very hot offices towards south because of lack of over hang and glass at the entire façade. One day, a secretary had her phone at her desk and suddenly it said on the screen that it was overheated. This means that the temperature on this spot was more than 36 degrees Celsius, which is unacceptable in an office. More people had to move to other places

in the building to have shadow and some started to cover their windows with moving boxes and pieces of paper to keep out the sun. Due to that the savings also hit the ventilation system to be one ventilation system for the entire building contrary to diving the ventilation system into two. So the temperature of the rooms compensated for each other, meaning if it was very hot in the offices towards south, it was very cold in the offices towards north. During the summer, when the people towards south left their offices because it was too hot, one could go to the offices towards north finding people sitting in woollen sweatshirts to keep warm. Additionally, if the weather was bad and no sun towards south, the temperature was likewise in the offices towards north.

One of the luxurious aspects of the building and adding more value to the building was the large terraces around the building. Towards south there was a large terrace connecting the student space with the employees' space, which was the philosophy of the building "We are together – I am civil". However, the saving round cut the middle piece of the terrace and the terrace was divided into two. The savings were on the wooden floors and the foundation, but the rails had to be there anywhere, because there had to be railing towards the roof at both sides. For this reason, the savings were minimal in practice and maybe non-existing. Additionally, the terraces at other places of the building were saved. However, the doors to get out were not saved, and so there was a door but no flooring, which is why people could walk directly on the asphalt roofing. Additionally, a wire was put on the top of the asphalt roofing as a cage-arresting device to indicate that you were not allowed to be there. This is not a great solution.

The finishing of the walls in the toilets were saved, which means the filling of the walls. However, in the construction phase, they did not save the filling, but the filter, which resulted in very bad finish at the walls of the toilets.

The digital screens were saved in the saving round, which is why it was taking out of the project. However, the users wanted the digital screens and so they were added to the project again afterwards, but within the construction phase.

Additionally, the digital solution of cards for unlocking the doors were saved because it was not a requirement from the beginning, and so the doors were planned to be with old keys. However, the CS wanted digital doors, which is why it became a self-financed matter within the project.

According to the laboratories, multiple faults occur according to what the end-users wanted and have ordered. Some of these mistakes were pipes sitting too low, difficulties of transporting materials into the laboratories, legal painting cabin, ventilation shifts without the legal insolation, rooms specified with specific cooling requirements not fulfilling these requirements, electrical boards situated in wired places and enlarges subsequently to the tendering, bad acoustics from the laboratories to the offices (although it was mentioned multiple times) vibration free foundations which vibrated more than the floor and so on.

In the climate laboratory, high boxes for research and experiments had to be situated underneath a grating cover for the ventilation machines to be situated upon. However, the water pipes ran underneath the grating cover contrary to at the grating cover as agreed upon, which is why the big boxes could not be there. For this reason, the pipes had to be moved subsequently, but because of the difficulties of this, they only moved them on one side instead of both sides, and consequently the flexibility of the room disappeared.

The ventilation pipes were drawn in the drawings. However, the advisory group did not draw the insolation of the pipes, so the insolation could not physically be there when the gates had to be open. For this reason, the workingmen removed the insolation for the possibility to have the port open, but the lack of insolation is illegal.

Specific rooms were required to contain cooling. However, the cooling boxes that they added in the room, was not dimensioned to fit the low temperatures in the size of the room, and so the room were not functional.

The electrical boards were indicated at the tendering of the building project. However, during the construction period, the electrical boards were too


Bygningsstyrelsen
Aalborg Universitet, Institut for Byggeri og Anlæg
NYBYGGERIET
PLANLÆGNINGSFASEN
PROGRAMHÆRING OG DISPONERING
OVERORDNEDE MILEPÆLE
FORSLAG
POLITISK GODKENDELSE
PROJEKTERINGSFASEN
FORPROJEKT
HOVEDPROJEKT
ENTREPRISEUDBUD
PRÆKVALIFIKATIONSFASEN
UDBUDSFASEN
ENTREPRISEARBEJDER
UDFØRELSE
FØR AFLEVERINGEN
AFLEVERINGEN
OVERDRAGELSE OG IBRUG

small, and they had to enlarge these. This was done without asking the end-users and investigating why they were situated as they were, which resulted in bad placement of the electrical boards. One of the large electrical boards were situated really badly, and they had to remove the board, which was very expensive. The problem was that the end-users saw it in the initiation of the installation and pointed it out to the building owner and advisory group who said, that this had to wait until the project was delivered, because the electricians did as the drawings showed them to do. For this reason the electricians were putting up the electrical board, tearing it down and putting it up again in another place, which was very expensive and time-consuming.

In two rooms, the experiments required vibration-free foundations. The foundations were made as separate foundations for the foundations to be vibration-free contrary to the floor. However, in practice the single foundations vibrated more than the floor, and the foundations had to be removed and cast again. This was significantly cost- and time-consuming because of figuring out what to do in the building that was built.

Moreover, multiple construction mistakes having an influence on other functions. Some mistakes are the structural system, various sizes of mortar joints, bad finishing and details between two rooms in the connection to doors, windows situated wired compared to the possible furnishing of the rooms, kitchen made without standard solutions and as such it is not useful and does not fit standard fridges. Additionally, a sitting stair without railing for users to fall down, the placement of the entrance compared to the parking lot of cars and bus stop, the situation of the bicycles because of the stormy weather and no shade from the wind and an elevator shaft which is in situ build and is 14 cm tilted, which caused that the openings had to be cut afterwards for the elevator to open.

The structural system concerns the fact, that the building originally was stabilized by plates and disks but at some point it was changed to beams and columns. However, the floor plans were not changed, which is why the beams had to be situated in the best possible way. This activity was a challenge because of non-identical rooms of the floor plan, so some spaces were added a column without concerning the functionality of the room. The worst part is in the seminar rooms which, in general, are badly proportioned according to a screen, blackboards and teaching, and they added a column two meters into the room. The space between the column and the wall is useless, but the department still have to pay rent for the square meters. The same occurs in some group rooms, where the column is situated 30 cm from the wall, which makes it important to clean in-between the column and the wall. At a blind end for a touch down space, a column was also situated. However, in stead of irregular spaces, the space from the column to the outer wall, which is a space of 3 x 0.6 m, is closed by a gypsum wall, but the Department still has to pay rent for the square meters. Instead of a wall, this space would have been great for storage space, which is needed.

There are various sizes of mortar joints in the building ranging from 1 millimetre to 20 cm to cover the tilts of the building. The gap between the windows and the ceiling was 10 cm, which they decided to add a mortar joint as opposed to ordering windows fitting the height of the room.

The flooring of the floors are red linoleum. When there is an transition to a new room, a door is situated and additionally is a metal bar in the floor due to a cut in the floor to reduce noise from one room to the other. However, this detail was not cleared among the contractors and the advisory group, which is why the finishing is very bad in some spots. The flooring people have cut the flooring very badly, which have subsequently been fixed with joint filler. In other spots, the floor is not glued to the floor and therefore has bubbles. For this reason, there were multiple areas where the water potentially could run underneath the linoleum and rot underneath and develop mould fungus. Additionally, the various solutions are unsimilar.

The windows of the offices are designed from the outside in and not the inside out, because the windows are situated very wired compared to the furnishing of the spaces, which in many cases lack the possibilities of furnishing them in other ways. In some offices, the window is very small, also caused by the broad barred absorbing large amounts of daylight. In other offices facing south, the windows cover the entire façade, which is why it becomes too bright and warm when the sun is up.

The building have three kitchens – one for the employees and two for the students. The requirements for the kitchens were not high and they were furnished by standard modules. However, the kitchens were custom made by the carpenters of the building project, which made it very expensive to change subsequently, for instance getting a shelf for cutlery and getting fronts of the kitchen wickets similar to the existing, so as to get a holistic kitchen. Additionally, the working men had forgotten water to the unattached kitchen table, where the coffee machines were planned to be situated, and so they had to redo it afterwards. The cupboards for the fridges were not standard fridge cupboards but broom cupboards, so the integrated fridges had to be switched with smaller fridges to fit the kitchen.

At the student kitchen, a sitting stair was situated for the students to arrange sports events, video nights et cetera. However, the open stairs were open in the top, so some users nearly fell down the stairs, but because a railing was not a part of the building project and the building owner would not pay for it.

The entrance of the building is facing the rest of campus. However, both the bus station and the parking lot is situated at the other end of the building. With a building which is 100 meter long, the entrance of the building becomes an irritation for people, because they have to walk a long way to get to their office.

The bikes can be situated next to the entrance, but there is not room enough for all the bikes. Because of this, the bikes have to be situated in the middle of the blind road where there is space for the bikes, but the wind is very strong, and the bikes fall down. This is very problematic, because multiple students and staff arrive by bike, but their bikes are damaged by falling down constantly.

The elevator shaft was in situ build in the beginning of the building project. However, they did not measure the verticality of the shaft, and so the openings to the elevator had to be cut so the elevator could open, when the elevator was installed in the building. After a year, the elevator still has problems such as people getting trapped inside which the elevator companies have difficulties figuring out why occurs.

Subsequently to the moving in, but not paying rent yet, multiple mistakes are found such as the water basins are not leak-proof, so the water is running out of the basin both within the concrete and at the door into the water basin. Additionally, columns at the northern façade which are starting to break, and nobody knows why despite the fact that experts have been added from Germany, concrete floors have been redone four times because they cracked during hardening, water running into the house during heavy rain both at the façade and at a drain, which was not supported, which caused water damage. Multiple other construction mistakes occur due to bad construction and bad drawings.

In one of the laboratories, a large water basin was in situ build. Based on existing knowledge from earlier water basins, the leak-proof nature of the basins could be a problem. The water basin was tested once, where the water was pouring out of the water basin. The workingmen fixed the water basin. However, the end-users were sceptical, which is why they asked if they could get epoxy on the walls likewise the floors, but the advisory group and building owner said no, so equipment for 10 million DKK. was installed in the basin without knowing if the basin was leak-proof. Unfortunately, the basin was not leak-proof, so the basin had to be injected from the outside, because it was impossible to go behind the machines to make the injections. However, the staff worried that the injections would damage the machines, so they were unhappy.

In the truck aisle towards the north, three storages were cantilevered supported by concrete columns. In April, nine months after the AB92 delivery, the columns started to crack. The end-users were afraid that the building would fall apart, but the advisory group said that it was frost burst. To ensure the judgement, experts from Germany were called to inspect the cracks in order to figure out why the cracks occurred. Subsequent to the experts arrival, nothing happened, and the users believed that everything was fine.

The floors at the ground floor in the laboratories required large loads and rotations of trucks with heavy material, so the strength of the floor had to be high. Apparently, it was difficult to get a flooring materi-

al strong enough and workable for large floors like these, because the flooring had to be demolished three times before the fourth floor was accepted. However, the first time a truck entered the laboratory for structural engineering and drove on the “spændplan”, which is a part of the floor requiring high tensions, during experiments, the floor cracked several times.

Additionally, the building leaked at the southern facade d water was running into the offices during rain and storm, and further it rained into the climate hall in the middle of the room, indicating, that there was water in the insolation at the roof of the climate hall in connection to the windows of the offices.

Moreover, there was a water damage when it rained a lot, because one of the drains was not supported, so it broke when large amounts of water ran through the drain, with the consequence of water running into the basement and causing damages.

REASONS FOR THE MURDER

The day for the scheduled completion of me arrived. The contractor advised notification of the finalization of me to the building owner 14 days ahead, which is why the contractor declared that I was ready for an AB92 approval. In between, the building owner invited the end-users, the tenant staff and the advisory group to participate in an inspection of faults and deficiencies prior to the AB92 approval. The end-users and the tenant staff were unhappy already when they entered my hall. They said "There is no reason for us to be here. It is not finished yet". The building owner was tired of listening to the complaints so he responded: "You are more than welcome to skip this inspection of, but we are doing it in order to argue that the building is unfinished legally." The building owner did not like the procedure himself, but legally he was bound to document a list of major faults and deficiencies of me at the day of the notified AB92 approval. Otherwise, the building was accepted, and the contractors had completed their working task. Like all the participants, I was tired and weakened. I felt that nobody took me seriously and that the political and legal aspects were more in focus than me. I wanted to be the star, but I was just a pawn in the political game. The end-user and the tenant staff decided to follow the inspection of defects to ensure the documentation of the faults and mistakes. They still had the intention of receiving a perfect version of me. I really appreciated their persistence. Based on the multiple conversations that I had listened to from the workingmen, I knew that many of them were trying to keep their own schedule and not thinking about me as a total. I was worried about the consequences if the workmen were not forced to complete their working tasks on me. Would I then be another public building uncompleted? Would I be a new Bio-case? I was already close to being a new Bio-case – which was the only requirement for all the participants in the start-up phase – "It must not be a Bio-case".

After looking into four of my offices, the participants identified numerous repeated faults and deficiencies. For this reason, the building owner had enough documentation to reject the AB92 approval. Legally, the building owner was bound to be present at the day for the AB92 approval even though they rejected the completion of me. To make the process fair for the contractors, the building owner emailed the contractor prior to the day for AB92 approval to inform them about the future rejection. I was sad. I just wanted to be perfect. I wanted everybody to like me, but the fact was that everybody started to hate me. It was not my mistake. I did as they told me – was standing when they helped me to stand, was pouring water when they told me how to. However, I could not give them what they wanted unless the workingmen told me how to do it by connecting the water to the pipes, making waterproofed walls, putting up lights, ensuring the workability of the ventilation, making the sewer system work and apply heat as needed. I was very frustrated. Likewise were the participants.

Subsequent to the rejection of the AB92 approval, the contractor once again invited the building owner to an AB92 approval 14 days after to the first rejec-

tion. Within these 14 days, the steering group gathered to agree upon rejecting the AB92 approval of me. This continued three times.

The fourth time was close to the summer holiday. The new leader of the building owner was very interested in approving me due to political agendas of the building owner organisation. The steering group once again agreed upon rejecting the building, which is why they all went on summer holiday letting the new man reject the AB92 agreement.

The day arrived for the AB92 approval. It was hot, and the sun was burning. I was hopeful because I knew that I was going to be finished due to today's rejection. I saw a taxi pull up next to the construction site trailer and the new man of the building owner jumped out of the taxi and walked into the construction site trailer. The taxi stayed at the parking lot with the taximeter was counting. The new man came out of the construction site trailer along with the contractors. I looked at them as they entered my entrance and left again. The new man jumped into the taxi again, and they left the building site. The contractor looked happy, and I was confused. What was going on? Did the contractor want to work on me forever? I thought he was going to be mad by being rejected for the fourth time.

At the end of the day, the participants of the steering group meeting and the building owner meeting received an e-mail from the new man representing the building owner: "Today I approved the building for Department of Civil Engineering."

…

That was it. I was officially murdered.

…

The participants of both the steering group meeting, building owner meeting and user group meetings were devastated and angry. They tried their best to resuscitate me by demanding the acceptance unacceptable because the steering group did not approve the action, but nothing helped. I was legally accepted.

Within 14 days, the contractor had to fulfil the faults and deficiencies, which according to AB92 is within a reasonable time span. However, the working men left the building. They were no longer interested in me. They had other buildings that they had to finish, and so I was forgotten.

The summer sun was burning, and I was lying there – all empty – all by myself. Few end-users came to visit me along with a few workingmen, but otherwise, I was all by myself.

Postscript at page 66...

AB92

The AB92 is a Danish building agreement obeyed by the majority of Danish building projects. AB92 is not a law, but a General Condition (in Danish: Almene Betingelser) implemented into the contract making the General Conditions legal, concerning the work and supply of the AEC sector.

On December 10, 1992, the Danish Ministry of Housing and Buildings developed the AB92 based on AB72, developed November 23, 1972. Further implementation into the AEC sector occurred July 1, 1993.

AB92 describes the various legally phases of a project such as the Contractual basis, Performance bond and insurance, Performance of the contract, The employer's obligation to pay, Extension of time limits and delay, Handing-over of the work, Defects, 1- and 5 year inspections, Special provisions on determination and Disputes (Hansen, 1993). Within each section, various paragraphs elaborate on the content of the specific section.

The handbook of AB92 for practitioners is the everyday language of the AEC sector called 'The Bible'. The reason for the name is the common reference of the AB92 in contracts. If the practice of the project is unwritten in the handbook, it is not followed. For this reasons, there are sizeable amounts of money saved or spent within the AEC sector according to the specific words of the AB92.

However, the handbook of AB92 is not black or white. Multiple formulations are vague according to a specific position of the problem, such as section 28 subsection 2 mentioning 'essential deficiencies' (Hansen, 1993). Both words are imprecise causing confusion and disagreement among the participants due to various expectations of the word 'essential' and the word 'deficiencies'.

In the case of the building for the Department of Civil Engineering, the match of expectations among the participants was nonexistent. The Steering group rejected the acceptance of the AB92 approval due to lack of completed work such as floors, ventilation and electricity. This was legally acceptable, due to AB92 section 28, subsection 2, identifying that an essential deficiency refers to if the building owner is unable to accommodate the working tasks of the completed buildings. With the lack of flooring, this was acceptable legally.

However, the building owner, without the acceptance of the Steering group, accepted the building project at the AB92 approval. The acceptance caused various rearrangements among the commitments (Hansen, 1993):

- The risks and maintenance obligation surpass to the building owner
- Five years of responsibility of the entrepreneurs from the day of acceptance
- Five years of responsibility of the suppliers from the day of acceptance
- One year and five years inspection from the day of acceptance

Additionally, the following aspects become effective at the AB92 approval:

- Security of the contractor reduces from 15% to 10%, and a further reduction is agreed
- Deadline for submission of the final settlement of the contractor
- Rights and obligations of the contractor related to correction of fault and deficiencies within a period

In this case, the acceptance of the AB92 approval influenced the cost overrun of the building budget, due to approximately 2400 faults and deficiencies allocated at the AB92 approval, but not corrected subsequently to the AB92 approval. At the day of the publication of this report, the list of faults and deficiencies was unresolved.

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AB92-Aflevering_Mangelliste

Sag: 5060.01
Navn: Aalborg Universitet, Byggeri og Anlæg
Dato: 2016-07-08
VVS-instalationer og ventilationsarbejder

Niveau -1 [kælderplan]

Pos. nr.	Rum nr.:	Placering:	Mangel
1	1.-102		
2			Varmerør ikke isoleret
3			MEGET pakgarn
4	G1.-101		Varmerør ikke malet (sort)
5	1.-101		Varmerør ikke malet (sort)
6			Aggregat rengøres indvendigt
7	1.-107		Måler på varme mangler dæksel
8			Brandsektionstætning af Varme- køle- og afløbsrør
9	1.-104		Brandsektionstætning af sprinklerrør
10			Brand/lydtætning af afløbs- og varmerør gennem væg mang
11	1.-108		Varmerør ikke malet (sort)
12	1.-110		Brand/lydtætning af afløbsrør gennem væg mangler
13	1.-111		Aggregat rengøres indvendigt. Aggregat kører ikke
14			Vandlås i grube mangler
15	1.-113		Bæringer for varmerør sidder i loft
16			Vandlåse mangler
17	1.-121		ventilation ikke indreguleret
18	1.-123		Brand/lydtætning af kølerør gennem væg mangler
19	1.-125		Køleflade skal monteres
20			Aggregat rengøres indvendigt. Gælder alle
			. Aggregatër kører ikke
			Brand/lydtætning af kølerør
			Brand/lydtætning af

CONSEQUENCES OF DELAY

The time and cost overruns of the building project had consequences of the budgets of the various companies and organisations involved in the building project process.

The building owner, the Danish Building and Property Agency (BYGST), received rent at the time of completion of the building project, which is why they enhanced the completion of the building within the schedule for BYGST to receive rent. Further, an official document from the Ministry confirmed an acceptance of allocation of money for the specific building project (Bygingsstyrelsen, 2013; Bygningsstyrelsen, 2015). The official document was limited in time, which is why the completion of the building project had a deadline. To ensure the progression of public buildings, the current Head of BYGST and the Permanent Secretary of State signed a document forcing BYGST to complete 80% of the building projects within schedule plus one month and the last 20% within the following three months in return for receiving a bonus (Bygningsstyrelsen, 2015). For these reasons, the delays had financial consequences for the BYGST budget.

The incentives of the advisory group for completing the building project were to fulfil an internal schedule of employees on the various cases allocated a certain amount of hours, for the company to earn money on the building project. If an extension of the building project process occurred, the advisory group were forced to allocate employees to the building project process for an additional period and consequently adding working hours contrary to earning money for the company. If the contract and an extra fee for extra working hours of the advisory group contained, an allocation of the money elsewhere occurred. The consequences would be new drawings of the building project caused by changes in the building design due to the building owner being unable to receive additional money from the Ministry based on the existing official document.

Similar to the advisory group, the incentives of the landlord to complete the building project in time concerning the allocation of employees at the building project, being unable to allocate the same employees at other building projects. Additionally, Campus Service (CS) contained various subdivisions implementing various functions into the building following the handover of the building project such as cleaning, moving, plumbing and heating, electricians, IT and furnishing. Similar, these subdivisions allocated employees on the various projects, which is why they were influenced by the delays of the building project.

The incentives of the end-users to finish the building within schedule were caused by a cancellation of the rental agreement of the existing building at the date of the completion of the new building project. As seen, a previous case of continuing the contract of the renting buildings results in a cost for empty buildings. Previously, a similar situation at Aalborg University was a story in the national news due to waste of public money (Bak, 2013; Hansen, 2013). For this reason, the Department was displaced due to time overruns of the new building project, and was relocated to other buildings, which potentially was more expensive than the existing rent. In relation, moving from one place to another was costly due to both moving furniture and the Department staff repacking twice. Moreover, the irritation and discussions among the Department staff concerning the move were time-consuming and costly as opposed to spending time on research. Additionally, the laboratories of the Department closed due to inability to do experiments because of lack of space, and so the Department lost income from both internal research and external companies renting the laboratories for experiments. The lack of internal research additionally required extensions of PhD projects as result of an inability to complete their project in time and additionally full-time Department staff were unable to conduct new experiments for the further development of papers for the Department to earn money. Also, the incomplete building and lack of facilities at the laboratories was unfavourable according to an external foundation based on bad reputation concerning lack of functionality of laboratories. Caused by these examples, the Department lost a significant sum of money unable to be documented within budgets, and additionally, the trust in the Department of external companies and fundings had to be rebuilt during the coming years. Moreover, the students of the Department were unable to conduct experiments, which is why the educational level of the candidates decreased compared to previous students. Moreover, the laboratory had 15 Department staff unable to fulfil their working tasks, and so the De-

partment wasted money on these Department staff.

The individual budgets of the involved organisations in the building project process were a significant reason to complete the building project within the original schedule. Next year's budget depended on the previous year's budget, which is why the consequences of a budget lower than expected caused an allocation of less money compared to previous years for the building owner, Department, Faculty and University. This consequence resulted from the University being a part of the public budgets. Contrary, the budgets were unable to be exceeded which in the worst case caused firings of staff within each organisation. For these reasons, the building project had to be completed within schedule.

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SUBSCRIPTION

Unfortunately, all participants of this project were to blam for the reason for my murder. Nobody can be left out. It is tough for me to list the exact reasons for why I was not the success everybody hoped for. However, the following pages list a few of the potential reasons for my murder.

POTENTIAL REASONS FOR THE MURDER

Meetings

The meetings were one reason for not being finished on time and additionally having multiple faults and deficiencies. The fact that there were five types of meetings might seem efficient because only the right people are involved in the specific topic. Oppositely, numerous of the same actors are involved in all meetings, and so topics and clarifications are repeated multiple times, due to the addition of a few new actors at the various meetings not being a part of the earlier conversations about the topics or clarifications. For this reason, multiple hours are wasted on doubling information, contrary to the progression of the project.

I believe a progressive meeting structure involves all participants as the base throughout the entire project, such as Knotworking (Engeström, 2008; Kerosuo, 2015). When specific knowledge is required, the specific specialists are involved. The specialist singularly adds information to the building project.

Hierarchy

The differences between the official hierarchy and the actualised hierarchy confused the organisation of the process of the project. There were no manager or facilitator of the project, because the actualised hierarchy diverged from the official hierarchy. This caused confusion among the participants in the decision-making.

I believe that it is important to have a fixed hierarchy for the participants to know the specific positions. The hierarchy has to be determined according to working tasks and decisions and include division of roles. Further, I believe that a flat, horizontal hierarchy is more efficient than a vertical hierarchy, because there is an openness among the participants, for all participants to contribute to the progression of the process. However, in the flat hierarchy, a division of roles is crucial to end discussions and holistically progress in the project.

Feedback

The procedure of feedback influenced the process by time-consuming processes of returning the answers to the advisory group. Moreover, large amounts of information were lost caused by the 'over the wall' syndrome (Evbuomwan & Anumba, 1998; Zhuang, Hu, & Mousapour, 2017), where the participants delivered information through emails attaching written documents. For this reason, the text was prone to interpretation, and in the end the documents were useless. One example is the data sheets made by the end-users. The data sheets contained the information of the specific machines such as height, length and depth and the required amount of power. However, the data sheets did not include the manoeuvre area around the machines and a further area for plugins such as ventilation and space for moving the machines. Consequently, the spaces were redesigned multiple times, and subsequently, the room is unusablefor the intended purposes since there is space for the machine but not the function of the machine.

I believe that the feedback procedure is improved by the advisory group receiving answers immediately while working contrary to waiting for the participants sequentially to review the design proposal and comments. For this reason, co-location is a solution to improve the procedure of feedback (Dave, Pikas, Kerosuo, & Mäki, 2015). Moreover, an internship of the participants – at least the advisory group – is preferably caused by the fact that they are able to understand the use of the machines and the working days of the end-users prior designing the spaces fulfilling the functions of the working days of the end-users (Archi+Med, 2015).

Communication

The lack of communication among the various participants and their colleagues with interest in the project was time-consuming for this project. Since the participants did not update their colleagues, conflicts arose by the time of involvement of the colleagues. The procedure became time-consuming because the participants and the colleagues had opposite opinions on the project.

I believe that co-location changes the behaviour of the participants, but not among the participants and their colleagues. Further, I believe that the project and decisions have to be open access to all involved actors of the project (Ross, 2003). Moreover, the involvement of the colleagues as specialists during the project reduce the contradictions, because they had been involved in the process. Further, the involvement and comments ease the working tasks of the colleagues subsequent to the completion of the project such as furnishing, IT and CTS management.

Rent

Another reason for the time overrun and multiple mistakes of the building project is the fact that there are no consequences for the majority of the participants of the building project if the building is not usable. The only participants for whom there are consequences are the end-users. They are unable to fulfil their working tasks because the building is not fulfilling the requirements of the end-users. However, this fact can have a financial impact on the tenant and the Faculty, because they have to redesign the building subsequent to the occupancy because new installations are required to fulfil the working tasks. Despite the lack of consequences for the advisory group of the building, the advisory group and the building owner intended to design the best possible building for the end-users within the specific budget and working hours. If the building is not a success, they receive the same amount of money as if the building was a success.

I believe that a Three-limb is preferable, for all participants to have consequences if the building does not fulfil the requirements (Love, Davis, Chevis, & Edwards, 2011; Ross, 2003). If the building fulfils the requirements and even further is better than the requirements, the participants collectively share the gain. For this reason, the participants intend to help each other designing a holistic building without multiple faults and deficiencies.

Advisory group

The procedure of choosing the advisory group is one of the reasons for the project being prone to time overruns and additional faults and deficiencies. The positive aspects of the frame agreement are lack of constant competitions among the advisors, causing major workload compared to the amount of winning projects. By having a team of seven advisory groups for four years, there is a potential for collaboration among the participants of each advisory group for developing improved building stocks. The negative aspect of the frame agreement is the potential of the triviality of the design based on the fact that the advisory groups know that they have won the project prior to designing it.

I believe that the seven sisters are a positive constellation based on the potential of collaboration and further improved building design. However, I believe that the Three-limb is a necessity in order to encourage the advisory group to think holistically and fulfil the requirements of the specific end-users.

Participants

Another reason for the time overrun is the multiple rejections of the building project causing extensions of the schedule. Based on multiple rejections of the building project, the building project lasted six years contrary three years as predicted. Caused by the duration of the project, the majority of the actors involved in the project at the beginning of the process did not fulfil the project, due to new job occupancies within the six years. When adding new actors to the project, knowledge of the specific project is lost because the impossibility of transferring all information to new actors. For this reason, the project did not progress when new participants were involved. Multiple aspects had to be repeated for the new actors to understand the context, and likewise, discussions were repeated for the new participants to understand the context and argue of the previous discussions (Kerosuo, 2015).

I believe that an efficiency of the process would improve the building project, because the reduction of time enhances the likelihood of actors working for

the same company during the entire project. The reduction of time is available by Knotworking, where intense working sessions progress the project by all actors being involved at the same time.

Users

The fact, that the word 'users' involves multiple actors having an impact on the building project is a major reason for the time overrun and multiple faults and deficiencies. Every user has an independent opinion on the project often conflicting with the agenda of the organisation, which results in questions, answers and requirements implemented into the project for subsequent to being abandoned resulting in multiple redesigns. Moreover, the organisations of the users have various agendas, making it difficult for the advisory group to fulfil all requirements and understand which requirements are the ones to follow.

I believe that it is important to follow the requirements of the end-users due to their profession and knowledge about their working day. The consequences of avoiding the requirements are an extra cost for the redesign of the building and installations subsequent to the occupancy of the building causing extensions of the time for executing the working tasks of the end-users. The method of Knotworking supports the continuous implementation of the requirements of the end-users in an iterative process. Through Knotworking, the end-users are involved either as a representative or as specialists (Korpela, 2015).

Agendas

Another reason for the time overrun and the multiple faults and deficiencies is the multiple political agendas of the organisations of the participants. The political agendas were modified during the six years of the building project process. Moreover, often the political agendas of the participants did not accommodate each other, which is why multiple hours were spent on discussing political agendas as opposed to progressing on the design of the building project. All political agendas were based on the economy, both as an incentive and as a consequence. For financial reasons, the participants were stocked to their political agenda, which is why they had to follow the agenda. However, often the political agendas did not reflect the individual opinion of the actor, which is why the actor personally was divided on this issue.

I believe that it is impossible to stop the modifications of the political agendas. However, I believe that it is significant to conduct a matching of expectations among the participants for the participants to understand the actions of the other participants. By making a match of expectations, the political agendas are enlightened for the other participants to understand the specific actions.

Budget

The budget of the organisations has an impact on the building project during the project, both according to the amount of money for the building project and stability of the specific actor such as firing and recruiting. In this building project, the actors of the building owner changed multiple times. The first actor was from the department in Skanderborg. The second actor was from Copenhagen due to by consolidations. Later in the project, new actors were implemented from Skanderborg in Denmark, because the budget related to the political agendas was modified to include Skanderborg.

Moreover, the size of the building was determined by the budget, based on political agendas. The building was too small to fit the functions of the end-users, but by enlarging the building, the building budget increased, while the price of a square meter was unchanged. However, the extra cost for enlarging the building influenced the other Departments at the Faculty, because the Departments solidary financed the total amount of square meters despite the fact that some building blocks were more expensive than others.

I believe that it is impossible to avoid the connection between the budget and the political agendas. However, if the building project is completed within a shorter time, there is a potential of the political agendas not changing during that time period.

Involvement of students

The students of the building were not involved in the process. This may not be a reason for the time overrun and the faults and deficiencies, but it influences the holistic approach of the building project. Since the students are not involved, they are not able to make similar requirements as the staff member, who in this report is referred to as the end-users. However, similarly, the students are the end-users occupying the building for approximately four years.

I believe that the students should be a part of the process as well because they spend multiple hours in the building. They know how it is to study, while the staff forgets how it is and focus on their own requirements contrary to the requirements of the students. By having Knotworking sessions, the students are a part of the Knotworking session as well as the staff members. At least, the students should participate as specialists at some Knotworking sessions.

Analysis of end-users

A reason for the time overrun is the general lack of insight into the working day of the end-users. Instead, the participants interpret the working days through their individual opinion for further converting the interpretation into the design of the building project. Often, the interpretations do not reflect the concrete working day of the end-user. This confusion caused multiple rejections of the project, because of the unusable spaces of the buildings according to the working tasks of the end-users. The variety of the end-users reflects the variety of the working tasks, which is why university buildings are far from standard buildings.

I believe that an internship of the working day of the end-users is required for the advisory group to understand the know-how of both the working day and the specific tools and machines of the end-users (Archi+Med, 2015).

Schedule and management

Another reason for the delay is the original schedule. Prior to the initiation of the building project, the schedule indicated a reduction of the pre-planning phase by 2-3 weeks compared to a similar process at other building projects. The reduced pre-planning phase was difficult to conduct due to a lack of process management.

I believe that it is possible to reduce the schedule by 2-3 weeks if the project is well managed by a manager or a facilitator. However, I do not believe, that the reduction is to be conducted in the pre-planning phased based on the fact that the pre-planning phase develops the conceptual aspects of the future building project, which is why this is the basis of the building project. If the basis is not good enough, the rest of the project lacks quality.

Development of schedule

The schedules of this project were divided into two: A general schedule and a 3-4 month schedule. In general, these milestones are progressive, but if the schedules are breached, there are multiple changes to the schedule.

I believe that the schedules conduct three levels: 'Long-term schedule' containing a general schedule with the general milestones, 'monthly schedule' containing the milestones of this month, and a 'weekly schedule' with a detailed level of tasks. Moreover, the participants conduct the schedules collectively for all participants to add their tasks at the schedule to ensure a realistic schedule, as the tool of Last Planner System in Lean Construction (Ballard, 2000).

Process

This building project couple the Programming and the Dispositional proposal into one phase called the Pre-planning phase. The aim of coupling is greatly shaped by the fact that the participants collectively design on the concept while gathering the correct information. However, the concept was fixed from the beginning of the building project process due to by

the geometry of the site and the conceptual ideas of the advisory group. The functions of the building were added to the volume contrary to the volume fitting the functions. Moreover, the functions were not identified before the initiation of the project, and so it was time-consuming to gather the information and design the concept simultaneously.

I believe that a coupling of phases is progressive for the building project based on the fact that iterative processes occur aiming to design holistic buildings. However, collaboration is required, which is why the coupling of phases is not suitable for Silo-approaches where the project is divided into professions but is more useful in Knotworking, where participants work collaboratively in an iterative process.

Change of activities in the schedule

Based on the fact, that the building project was prone to time overrun, the consequences for the organisations were multiple. The consequences influenced the budget of each organisation, which is why the political agendas were dominating during the finalisation of the building project. The consequences influenced the schedule by new activities implemented in the schedule such as time for reflection, time for rejection and time for reorganising the budget.

I believe that by introducing Knotworking sessions, the schedule is kept due to the progression of the project and the fact that progression reduces extensions of schedule and so to avoid new activities to be implemented in the schedule.

Facilities

The enforcement of moving the Department influenced the time overrun, based on the fact that the process lacked a match of expectations among the end-users and the Head of Department, and so various discussions extended the schedule. In general, the approach to the new facilities of the new building was positive. However, the new building was unpredictable, which is why the end-users were more comfortable by having their existing facilities. These discussions had an impact on the building project.

I believe that these discussions are natural and impossible to avoid. However, they can be reduced by implementation of the end-users in the process, for them to feel the involvement and by using digital medias such as Virtual Reality for the end-users to understand the spaces (Rasmussen, Gade, & Jensen, 2017).

Acoustics

The concept of the building was to collect all facilities of the Department in one building. The transparency of the building was necessary for both the architect and the Head of Department, for the end-users and their guests to visually see the functions and activities of the Department. However, an issue of the end-users was the fact that the activities of the laboratories acoustically is loud with machines vibrating during research experiments. The end-users were afraid that the vibrations and sound would be transferred to the offices for the end-users being unable to work. The discussions according to the acoustics were time-consuming and influenced the schedule through hours for both discussions and calculation of the acoustics. Acoustic calculations for all spaces were not a part of the engineering contract, which is why they wanted to calculate a minimum of acoustics.

I believe that the verification of acoustics is important for the building of various functions. For this reason, it is important to allocate time and money for conducting the acoustic calculations, and it has to be a part of the contracts.

Gathering of the Department

Another reason for the delay is the concept of collecting all actors in the same building – both students, researchers, laboratory people and the secretaries. With this activity, multiple agendas have to be verified. When the building project process was initated, the Department was mentally ready. They expected to receive ideas about how to build a building, while the professionals of the building project expected to be designing from the initiation of the design process.

The end-users had not agreed upon their wishes and requirements, so they slowed down the process. For this reason, some decisions were made by the individual actors without the agreement of the political agenda of the Department.

I believe that the idea of collecting all participants in one building is great. However, the process was long, and schedules were extended. The process was important for the end-users to prioritise the important aspects of their working day based on a lack of financial knowledge of a new building project. However, in a future process, I believe that a clarification among the end-users prior to the addition of the advisory group is preferable in order to make the time of all participants collected as efficiently as possible.

Building site

A reason for the time overrun and the lack of budget is based on the fact that the site development suddenly had to be a part of the building budget of this building project. The proposed budget of the site development conducted all buildings in the new master plan to pay a small amount of their building budget to pay for the site development of the area. Due to political agendas, the scheduled buildings were abandoned, and this building project was the only building to be built in the area. Therefore, this building budget was the single rider to pay for the site development. This constellation was informed to the advisory group in the middle of the process, so the advisory group was confused about the total amount of money allocated for the building. For this reason, the advisory group had difficulties designing and calculating the budget of the building because they did not know the budget boundaries. For this reason, the schedule was extended for the budget to be discussed.

I believe that the payment of the site development is a separate budget for a separate project. The payment of the site development should be a part of Shared Service at the University, which is why all Faculties should pay rent for this through Shared Service. By doing so, the project is not redesigned based on a smaller budget and the payment is not allocated to the Departments situated in the area but is a part of the entire campus.

Square meter

Another reason for the delay is the discussions about the amount of square meters. The end-users required 7,000 square meters for the new building. The Head of Department referred this amount of square meters to the Faculty, who informed the tenants at the University. The tenant contacted the building owner and required 7,000 square meters, from where the building owner asked the architects, who designed the master plan, to allocate 7,000 square meters for the building stock. At the first user group meeting is was clear that the calculation was wrong because the 7,000 square meters of the end-users did not fulfil the 7,000 square meters of the building owner. The reason was that the building owner had received the 7,000 square meters as gross square meters. The tenant had received the 7,000 square meters as net square meters. Moreover, the Faculty had received the 7,000 square meters as gross square meters in the terminology of CS which is referred to as the total amount of internal square meters excluding walls but including both common areas such as aisles and student areas. Traditionally at Aalborg University, CS pays for the aisles, common areas and technical spaces, the Faculty pays for the student areas, and the lecture rooms and the Department pay for the offices and laboratories. However, the end-user required 7,000 net square meters in the terminology of Aalborg University, which refers to the square meters that the Department has to pay for such as offices and laboratories excluding aisles, student spaces, auditoriums, group rooms and technical spaces. The confusion caused multiple discussions about the correct amount of square meters. Political agendas made the decisions difficult. In the end, an agreement decided a building stock of maximum 9,000 square meters gross according to the terminology of the AEC sector. The discussions were a reason for the delay caused by the fact that the advisory group waited for the exact amount of maximum square meters, which is why they had difficulties in designing the spaces.

I believe that a visualisation of the square meters at the first meetings among the Department and the Faculty had ensured the content of the 7,000 square meters resulting in an avoidance of confusion and misunderstandings.

Collaboration

Despite the fact that the advisory group was a group of advisors, they did not collaborate according to the design of the building project. However, they discussed the boundaries of their working tasks at the official meetings which was time-consuming for the project. An example was the energy demands of the building. The architect presented three storages rooms at the corridor and in the centre of the building. At a meeting months later, the engineering argued, that they could not improve the energy consumption caused by the three storage rooms, which is why the energy consumption of the building is high.

I believe, that collaboration among the participants would reduce such inconsistencies by the advisory group designing together contrary to separately, which was the case in this building project. By co-location, the engineer is physically situated in the same room as the architects, which is why they observe the drawings frequently to improve and develop the design so as to fulfil both design and technical requirements with the result of a holistic building.

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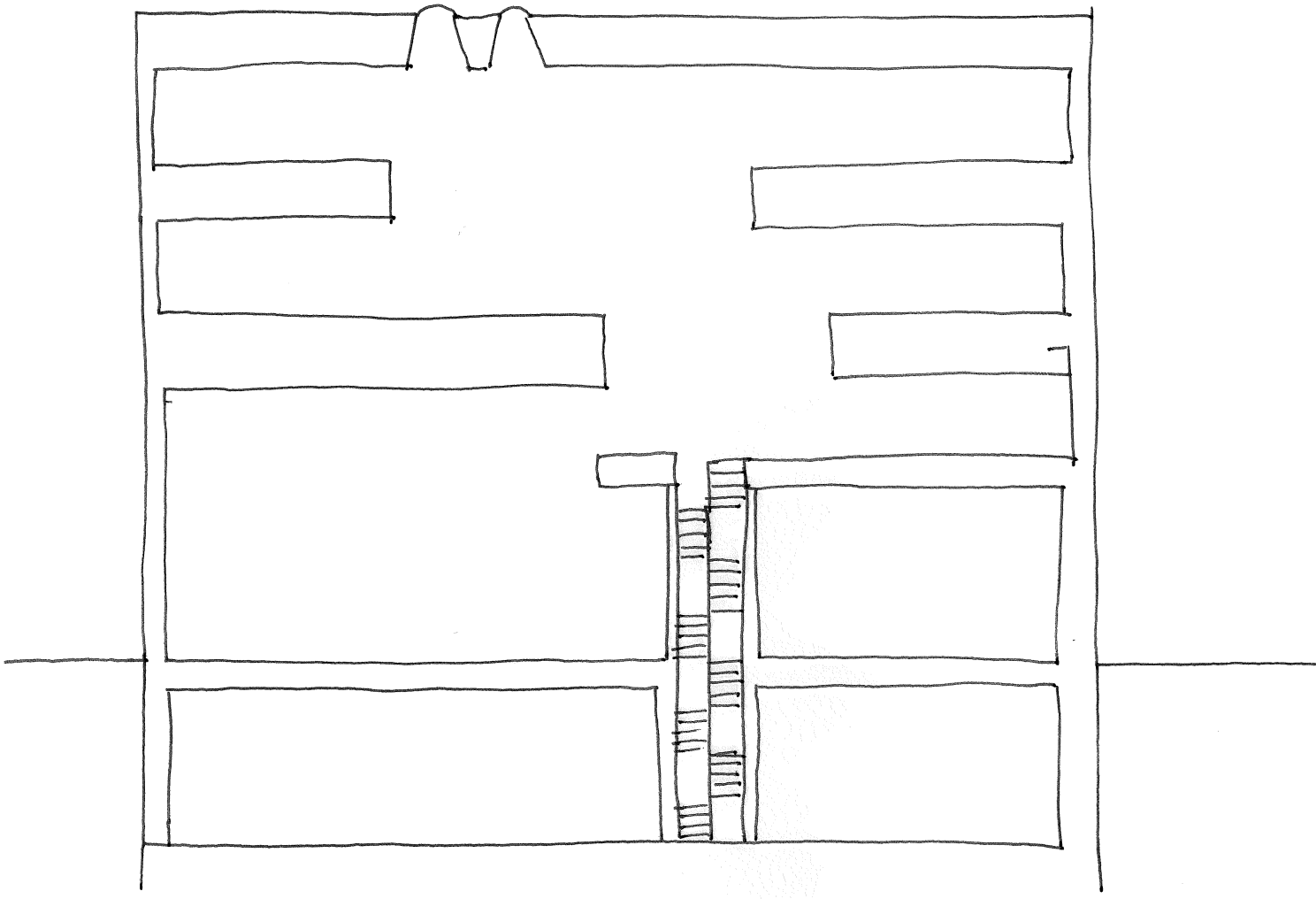
IMPROVEMENTS FOR FUTURE BUILDING PROJECTS

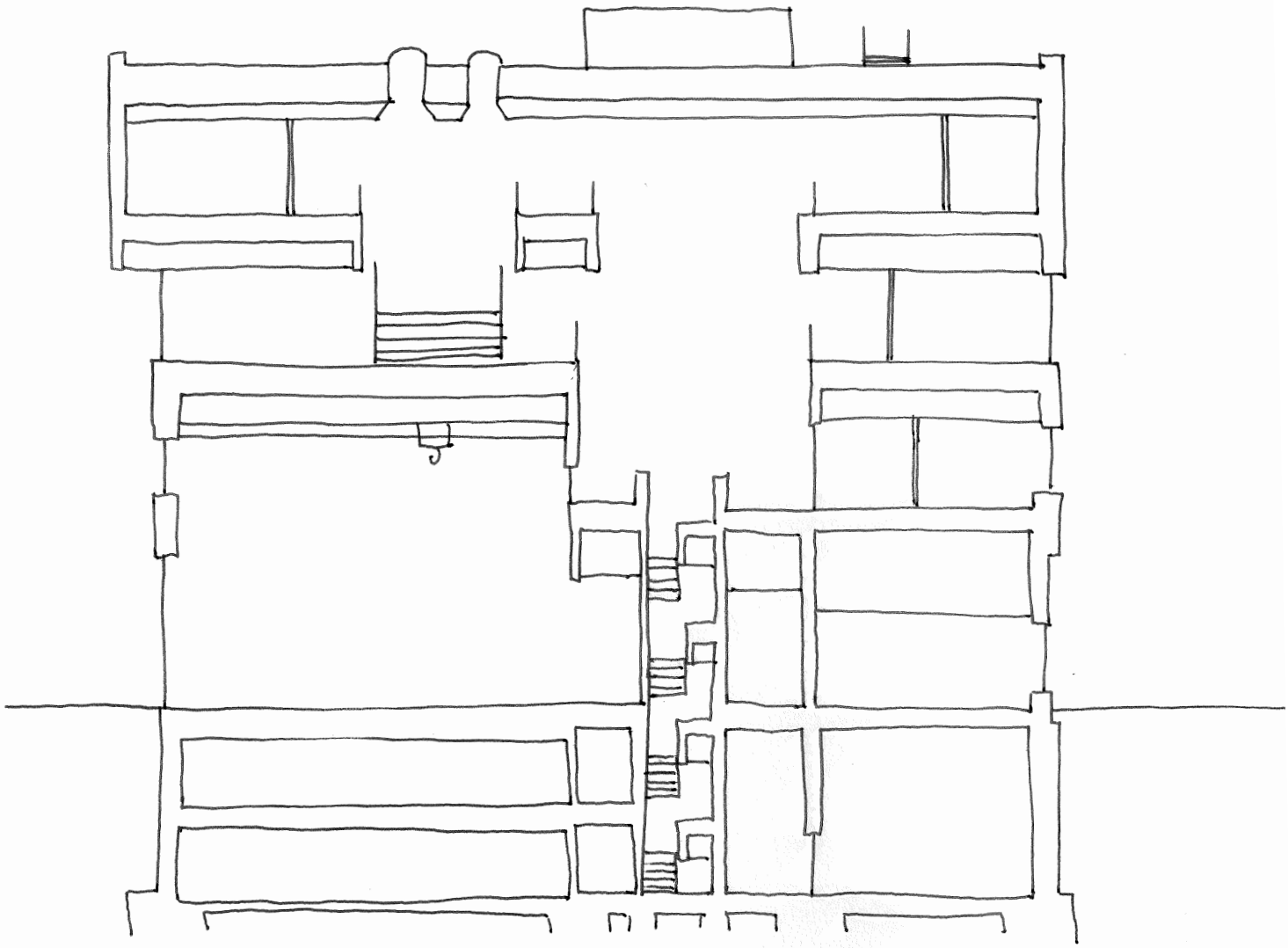
As a proposal to improve future public university buildings, the following checklist is conducted based on this case study.



Idea of the building project

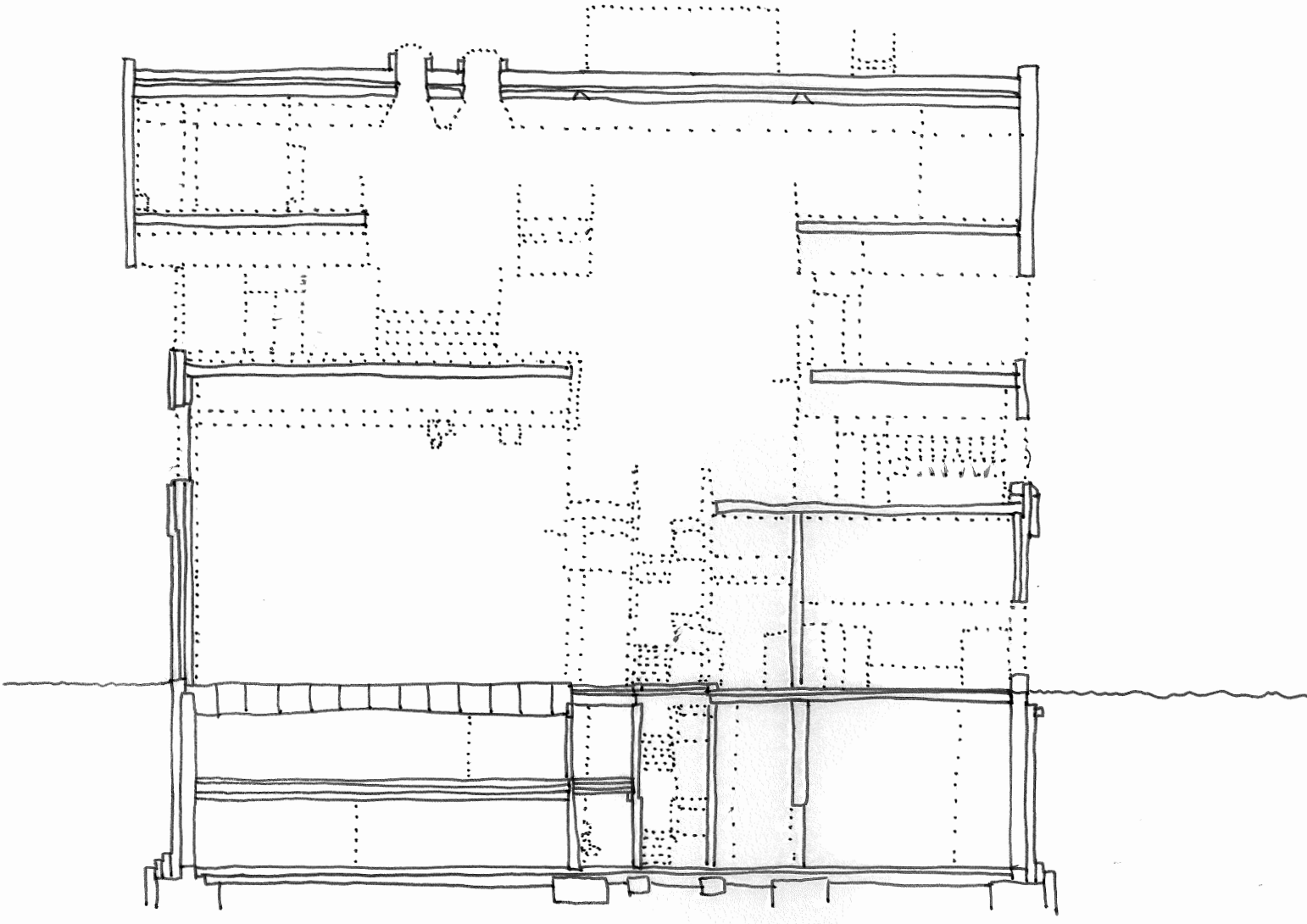
Prior to the design process

- [ ] Amount of square meters
- [ ] Building budget – what is included and excluded
- [ ] Division of roles for all participants
- [ ] Agreements of user requirements according to political agendas
- [ ] Which information at which time
- [ ] Date and amount of delivery
- [ ] Preliminary studies of the site: geology, coordination, environment and archaeology
- [ ] Date for hand-over
- [ ] Schedule of date for information
- [ ] Management of feedback of information
- [ ] Collection of documents such as contour maps and district plans prior to imitation of project
- [ ] Scheduled workshop days prior to initiation of project
- [ ] Development of data sheets prior to initiation of project
- [ ] Internship prior to the initiation of project
- [ ] Matching of expectation among the participants
- [ ] ICT agreement and contractual Legislations
- [ ] Scheduled technical meetings
- [ ] Standards for AV equipment
- [ ] Involvement of safety representative early in the process
- [ ] Noice measurement of the machines
- [ ] Procurement method and specific tenders
- [ ] Date for occupancy of the building
- [ ] Acoustical verification required in the contract
- [ ] Future extension by e.g. a new division
- [ ] Responsibility of the information such as data sheet
- [ ] Risk Management a part of the process and responsible participant or actor
- [ ] Schedule of acoustic verification
- [ ] Schedule of noise measurement
- [ ] Matching of expectation according to preparation prior to a meeting
- [ ] Procedure of purchase
- [ ] Procedure of implementation of comments in the design proposal
- [ ] Review of the specific room with the specialists of the room
- [ ] Requirements and wishes are registered in one document
- [ ] Agreements upon how to handle the budget during the process, such as cost savings drive
- [ ] Main schedule ready at the initiation of the design process
- [ ] Structure of decision-making
- [ ] Organisation of data



During the design process

- [ ] Imminence diagram
- [ ] Required rooms for all participants
- [ ] Strategy of fire
- [ ] Selection of materials
- [ ] Accessibility
- [ ] Maintenance and cleaning
- [ ] Budget
- [ ] Furnishing plans
- [ ] Meetings at the existing working place for spontaneous inspections to clarify questions
- [ ] Approximate cost of each wish
- [ ] Verification of all acoustics
- [ ] Pre-approval of all solutions such as safety, traffic regulations
- [ ] One available list of decisions
- [ ] One available list of wishes and requirements
- [ ] Technical meetings prior to sketches to gain knowledge about the specific functions
- [ ] Continuous review of the building according to functions such as containers, mail delivery
- [ ] Varieties of functions – working inside-out contrary outside-in
- [ ] Message signing inside and outside the building influencing the areas nearby the sign such as doors, glass
- [ ] Safety according to functions such as variety of chemicals
- [ ] Do reviews continuously during the design process
- [ ] Detailed schedule – no double bookings
- [ ] Start-up evaluation subsequently to matching of expectations
- [ ] Verification of the budget continuously by external persons in the AEC sector



Construction design

Subsequent to the design process

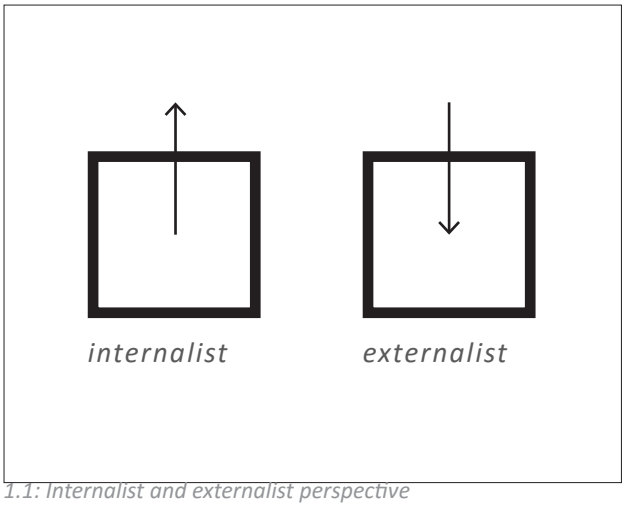
- [ ] Review of the project by the workmen collectively for them to understand how the building is going to build and develop an ownership of the building.

APPENDIX

APPENDIX 1

History of University buildings

Historically, the constitution of universities is 800-year-old with the first University described as Collegio di Spagna in Bologna from 1367. The typology is categorized into two groups: The internalist perspective and the externalist perspective. The division originates from the perspectives of science being either produced by inner forces (internalist perspective) or by the society where the problems occur (externalist perspective) as illustrated in Figure 1.1.

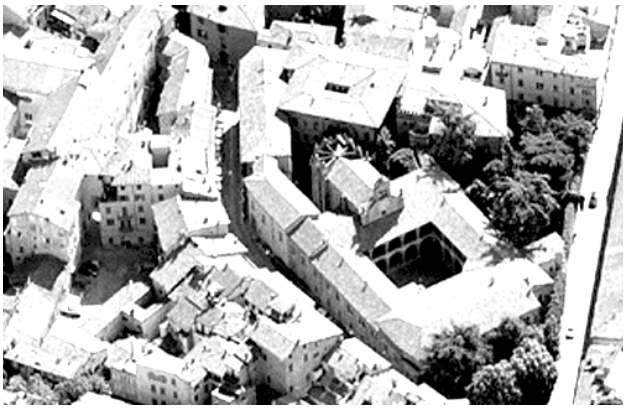


1.1: Internalist and externalist perspective

These perspectives are reflected within the organization of the University buildings. The internalist perspective collects all activities within the area of the University and does not open up for the society to naturally enter the site of the University. The externalist perspective welcomes the society and is situated among the society in various buildings (Caldeny 2009).

The internalist perspective is divided into three categories according to the historical timeframe (Caldeny 2009).

The College: As a small community, the area of the College had a church and small, square houses with a courtyard in connection to the church. Surrounding the College, a wall divided the additional city with the University. The Collegio di Spagna in Bologna from 1367 was a college collecting all activities inside the walls (Caldeny 2009).



1.2: The Collage: The Collegio di Spagna

The Campus University: Later, the tradition of the University was implemented in America. In America, the purpose of the Universities was to educate priests to missionary convert the Indians. There was no need for encircling the Universities because there were no existing cities related to the site. The tradition from the College of Europe was converted to have outdoor areas as yards in front of the houses instead of having the courtyard in the middle of the building. The Campus University covered all activities – education, dwelling, and sports facilities. The first Campus University is described in a letter from 1774 about the Princeton University (Caldeny 2009).

1.3: The Campus University: Princeton University

1.4: The External University: ETH Zürich

1.5: Universitas: Skolegade in Aarhus

1.6: The Institutional University: University of Oslo

1.7: City University: UTS in Sydney

The External University: In the 1960s the amount of students at the Universities increased to the double within ten years. This increase of students required an extension of the building stocks of the Universities, why multiple Universities were forced to build on the unbuilt lots often outside the city. These areas were called Campuses in spite of their lack of student accommodation and sports facilities. The similar characteristics of the College and the Campus University are that the External University additioally distances from the city and the society (Caldeny 2009).

The Universities of the externalist perspective are also divided into three categories.

Universitas: The mobility of the teachers was an important aspect of the Universitas. There was no commitment to a building stock, so the teachers had the possibility to move around from town to town. They used the churches for larger gatherings, but the Universitas had no commitment to the student residents. The students and the teachers rented residents in the same location, so they had a connection in this way. 'Studiestræde' and 'Skolegade' is leftovers from the Universitas in Denmark.

The Institutional University: In the 19th century the need increased for special laboratories for example astronomy and physics. The Universitas could not exist as before because there were not that many buildings or lots within the same area. Therefore, the Institutional University was divided into buildings all over the city, to cover the facilities of the University. The seminar room was developed to be the laboratory for the humanists.

City University: A critique of the Internal University according to their lack of integration with the society, generated the movement of implementing the University within the city again or implementing the city in the External Universities. Old factory buildings within the city were renovated to contain the Universities causing the Universities being implemented in the city.

Today, multiple Universities are divided into being both an External University and a City University. Aalborg University is a combination of an External University and a City University.

APPENDIX 2

Participants at the meetings

	Name	Time	Hours	Arch	Eng
22-08-2011	01_start-up meeting	13.00-14.30	1,5	3	1
08-09-2011	02_Developer meeting	13.00-14.30	1,5	1	1
13-09-2011	01_Project day	13.00-14.30	1,5	3	4
28-09-2011	01_User group meeting	9.30-12.30	3	1	1
18-10-2011	02_User group meeting	9.30-12.30	3	3	1
18-10-2011	03_Developer meeting	13.00-14.30	1,5	1	1
01-11-2011	03_User group meeting	9.30-12.30	3	2	1
01-11-2011	04_Developer meeting	13.00-14.30	1,5	1	1
15-11-2011	04_User group meeting	9.30-12.30	3	1	1
15-11-2011	05_Building owner meeting	13:00-14:00	1	1	1
22-11-2011	05_User group meeting	13.00-16.00	3	2	3
25-11-2011	01_Technical meeting meeting	8.00-14.00	6	0	3
29-11-2011	06_User group meeting	9.30-12.00	2,5	1	3
29-11-2011	06_Developer meeting	13.00-14.30	1,5	1	1
06-12-2011	07_User group meeting	9.30-12.00	2,5	1	3
06-12-2011	07_Developer meeting	13.00-14.30	1,5	1	1
13-12-2011	01_Section leader meeting	10.00-12.30	2,5	1	3
20-12-2011	08_User group meeting	9.30-12.00	2,5	1	2
20-12-2011	08_Developer meeting	13.00-14.00	1	1	1
06-01-2012	09_User group meeting	9.30-12.00	2,5	1	3
06-01-2012	09_Developer meeting	13.00-14.30	1,5	1	1
31-01-2012	10_Developer meeting	9.30-12.00	2,5	1	1
07-05-2012	10_User group meeting	10.00-12.30	2,5	2	3
07-05-2012	11_Developer meeting	13.00-14.00	1	1	1
22-05-2012	11_User group meeting	10.00-12.30	2,5	1	3
01-06-2012	12_User group meeting	10.00-12.30	2,5	2	1
07-06-2012	12_Developer meeting	8.30-10.00	1,5	1	1

Landscape	DBPA	TA	AAU	Department	Staff	People	Hours in total
2	2	2	0	1	2	13	19,5
0	2	2	0	0	0	6	9
1	2	3	1	1	9	24	36
0	2	1	1	1	10	17	51
0	2	2	1	0	7	16	48
0	2	2	1	0	1	8	12
0	1	2	1	1	9	17	51
0	1	2	1	1	1	8	12
1	2	2	1	1	10	19	57
1	2	2	1	1	1	10	10
0	2	1	1	0	8	17	51
0	0	1	0	0	16	20	120
0	2	1	1	1	11	20	50
0	2	1	1	1	1	8	8
0	2	2	1	0	10	19	47,5
0	2	2	1	0	1	8	12
0	0	4	0	1	6	15	37,5
0	1	2	0	1	8	15	37,5
0	1	2	1	1	1	8	12
1	1	2	1	1	9	19	47,5
1	1	2	1	1	1	9	13,5
1	2	2	1	1	0	9	22,5
0	1	2	1	0	4	13	32,5
0	1	2	1	0	1	7	7
0	2	2	1	0	3	12	30
0	1	2	1	0	3	10	25
0	2	2	1	0	1	8	12

	Name	Time	Hours	Arch	Eng
19-06-2012	13_User group meeting	10.00-12.30	2,5	2	3
19-06-2012	13_Developer meeting	12.30-14.00	1,5	1	1
14-08-2012	14_User group meeting	10.00-12.30	2,5	1	3
14-08-2012	14_Developer meeting	12.30-14.00	1,5	1	1
14-08-2012	01_Developer meeting_site preparation	14.00-15.00	1	1	1
28-08-2012	15_User group meeting	10.00-12.30	2,5	1	3
28-08-2012	1_Workshop about facades	12.30-14.30	2	1	2
11-09-2012	16_User group meeting	10.00-11.15	1,25	1	2
25-09-2012	17_User group meeting	10.00-12.45	2,75	2	2
25-09-2012	15_Developer meeting	11.00-15.00	4	1	0
16-11-2012	18_User group meeting	12.00-13.45	1,75	1	2
16-11-2012	16_Developer meeting	14.00-14.45	0,75	1	1
17-09-2013	17_Developer meeting	11.00-14.00	3	1	1
01-10-2013	1_Steering group meeting	11.00-13.00	2	0	1
07-10-2013	18_Developer meeting	11.00-13.00	2	1	1
16-10-2013	19_User group meeting	9.30-12.00	2,5	1	2
21-10-2013	19_Developer meeting	11.00-14.00	3	1	1
05-11-2013	20_Developer meeting	11.00-14.00	3	1	1
03-12-2013	21_Developer meeting	11.00-14.30	3,5	1	1
03-12-2013	20_User group meeting_Indoor Climate	14.30-15.30	1	0	1
10-12-2013	21_User group meeting_Triax	14.00-15.30	1,5	1	3
17-12-2013	22_User group meeting_Indoor climate	8.30-10.30	2	1	3
17-12-2013	22_Developer meeting	11.00-14.30	3,5	1	1
06-01-2014	24_User group meeting	12.30-15.30	3	0	4
09-01-2014	22_User group meeting_Indoor climate	11.00-12.00	1	0	3
17-01-2014	2_Steering group meeting	11.00-12.00	1	0	1
21-01-2014	23_Developer meeting	11.00-14.00	3	1	1
04-02-2014	24_Developer meeting	11.00-14.00	3	1	1

Landscape	DBPA	TA	AAU	Department	Staff	People	Hours in total
0	2	2	1	1	2	13	32,5
0	2	2	1	1	0	8	12
1	1	2	0	1	2	11	27,5
1	1	3	0	1	1	9	13,5
1	1	3	0	0	0	7	7
0	1	2	0	0	4	11	27,5
0	1	6	0	0	3	13	26
0	0	1	0	0	2	6	7,5
1	1	3	1	0	2	12	33
1	1	3	1	0	1	8	32
1	1	2	0	0	3	10	17,5
0	1	4	1	1	1	10	7,5
1	2	2	0	1	1	9	27
0	2	4	1	0	0	8	16
0	2	2	1	0	1	8	16
0	0	0	0	0	2	5	12,5
0	2	2	0	0	1	7	21
1	2	2	1	0	1	9	27
0	2	2	1	0	1	8	28
0	0	4	0	0	4	9	9
0	0	0	0	0	3	7	10,5
0	0	0	0	0	3	7	14
0	2	2	1	0	1	8	28
0	0	0	0	1	7	12	36
0	0	0	0	0	2	5	5
0	3	3	1	0	0	8	8
0	2	2	1	0	1	8	24
0	1	1	0	0	1	5	15

	Name	Time	Hours	Arch	Eng
25-02-2014	25_Developer meeting	11.00-14.00	3	1	2
19-03-2014	26_Developer meeting	11.00-15.00	4	0	1
08-04-2014	27_Developer meeting	11.00-14.00	3	1	2
23-04-2014	28_Developer meeting	11.00-14.00	3	1	1
01-05-2014	26_Usergroup meeting Projecthall Water	8.30-10.30	2	0	2
06-05-2014	29_Developer meeting	11.00-15.00	4	1	2
21-05-2014	27_Usergroup meeting_all laboratories	9.00-9.30	0,5	1	3
21-05-2014	27_Usergroup meeting_all laboratories	9.30-10.00	0,5	1	3
21-05-2014	27_Usergroup meeting_all laboratories	10.00-10.30	0,5	1	3
21-05-2014	27_Usergroup meeting_all laboratories	10.30-11.00	0,5	1	3
21-05-2014	27_Usergroup meeting_all laboratories	11.00-11.30	0,5	1	3
21-05-2014	27_Usergroup meeting_all laboratories	11.30-12.00	0,5	1	3
21-05-2014	27_Usergroup meeting_all laboratories	12.00-12.30	0,5	1	3
21-05-2014	27_Usergroup meeting_all laboratories	12.30-13.00	0,5	1	3
21-05-2014	27_Usergroup meeting_all laboratories	13.00-13.30	0,5	1	3
21-05-2014	27_Usergroup meeting_all laboratories	13.30-14.00	0,5	1	3
21-05-2014	27_Usergroup meeting_all laboratories	14.00-14.30	0,5	1	3
21-05-2014	27_Usergroup meeting_all laboratories	14.30-15.00	0,5	1	3
21-05-2014	27_Usergroup meeting_all laboratories	15.00-15.30	0,5	1	3
21-05-2014	27_Usergroup meeting_all laboratories	15.30-16.30	1	1	3
28-05-2014	30_Developer meeting	11.00-14.30	3,5	1	2
04-06-2014	3_Steering group meeting	12.30-15.00	2,5	1	1
14-08-2014	31_Developer meeting	8.30-14.00	5,5	1	2
01-10-2014	32_Developer meeting	8.30-15.30	7	1	1
09-10-2014	33_Developer meeting	8.30-11.00	2,5	1	1
22-10-2014	4_Steering group meeting	8.30-11.30	3	0	1
Total			**141,5**		
Average amounts of people					
Various people				6	6

Landscape	DBPA	TA	AAU	Department	Staff	People	Hours in total
0	2	2	1	0	1	9	27
0	1	4	1	0	1	8	32
0	1	3	1	0	1	9	27
0	1	5	1	0	1	10	30
0	1	2	0	0	2	7	14
0	1	3	1	0	1	9	36
0	1	1	0	0	4	10	5
0	1	1	0	0	2	8	4
0	1	1	0	0	1	7	3,5
0	1	1	0	0	3	9	4,5
0	1	1	0	0	2	8	4
0	1	1	0	0	2	8	4
0	1	1	0	0	1	7	3,5
0	1	1	0	0	4	10	5
0	1	1	0	0	3	9	4,5
0	1	1	0	0	5	11	5,5
0	1	1	0	0	4	10	5
0	1	1	0	0	4	10	5
0	1	1	0	0	5	11	5,5
0	1	1	0	0	3	9	9
0	1	4	1	0	1	10	35
0	4	3	1	1	1	12	30
0	2	4	0	0	0	9	49,5
0	1	2	1	0	0	6	42
0	1	2	1	1	0	7	17,5
0	3	3	3	1	0	11	33
						658	**1582,5**
						8,9	
2	7	14	2	1	28	66	

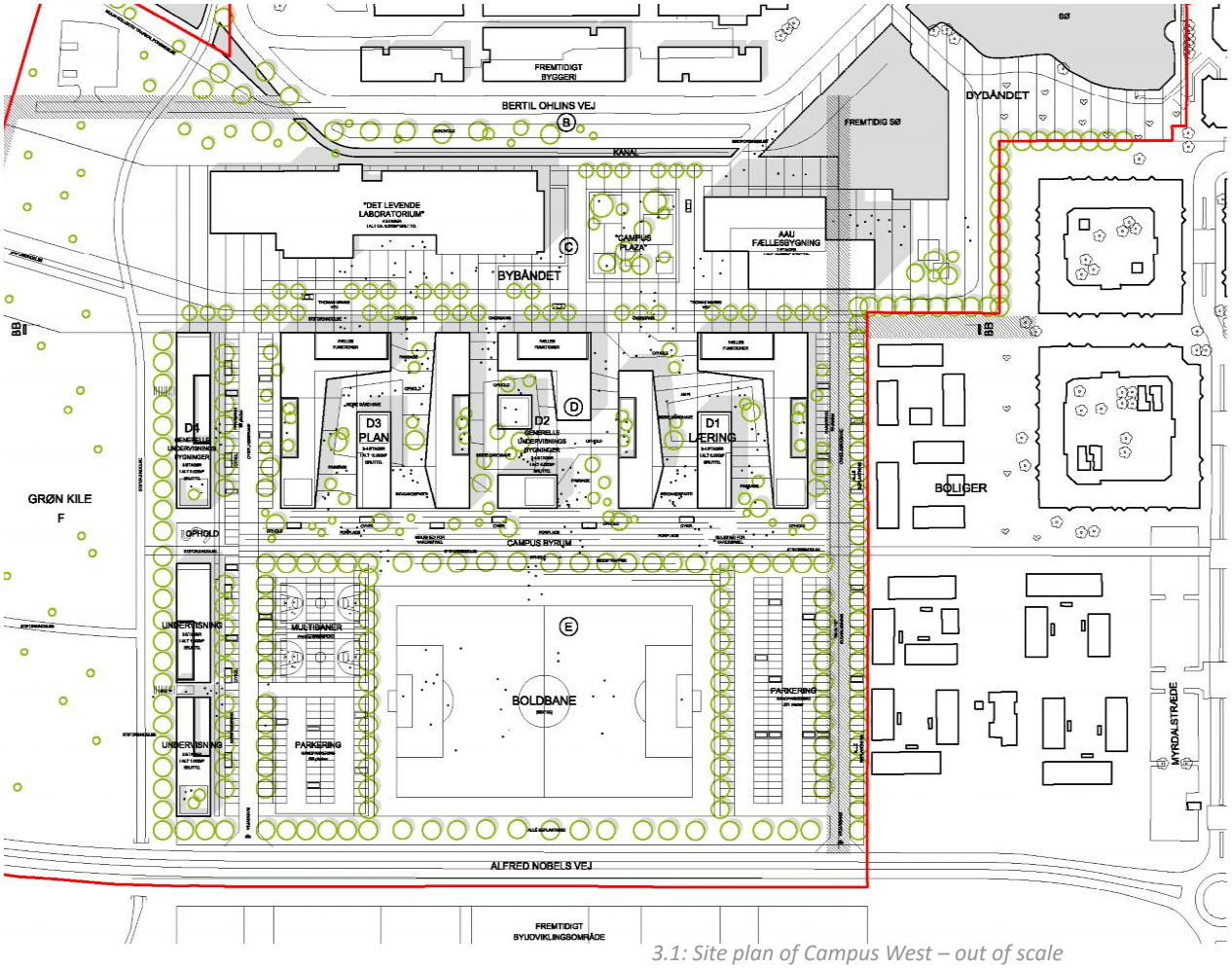
APPENDIX 3

New site for the Department

The address of the new building for Department of Civil Engineering is Thomas Manns Vej 23, 9220 Aalborg East, Denmark. Thomas Manns Vej is situated in the new area of Campus Aalborg East called Campus West. The site for Department of Civil Engineering is situated in the 'Bybånd' and initiates the University site from the west end. The entrance to the building is situated towards east facing the rest of the Campus, as illustrated in the site plan in Figure 3.1.

Moreover, the building is designed with large window areas in the façade, so as to make the activities of the building visible to the rest of the University and society.

The building covers 8,978 square meters and is divided into six floors and a rooftop. The six floors are the basement, ground, first, second, third and fourth floor.

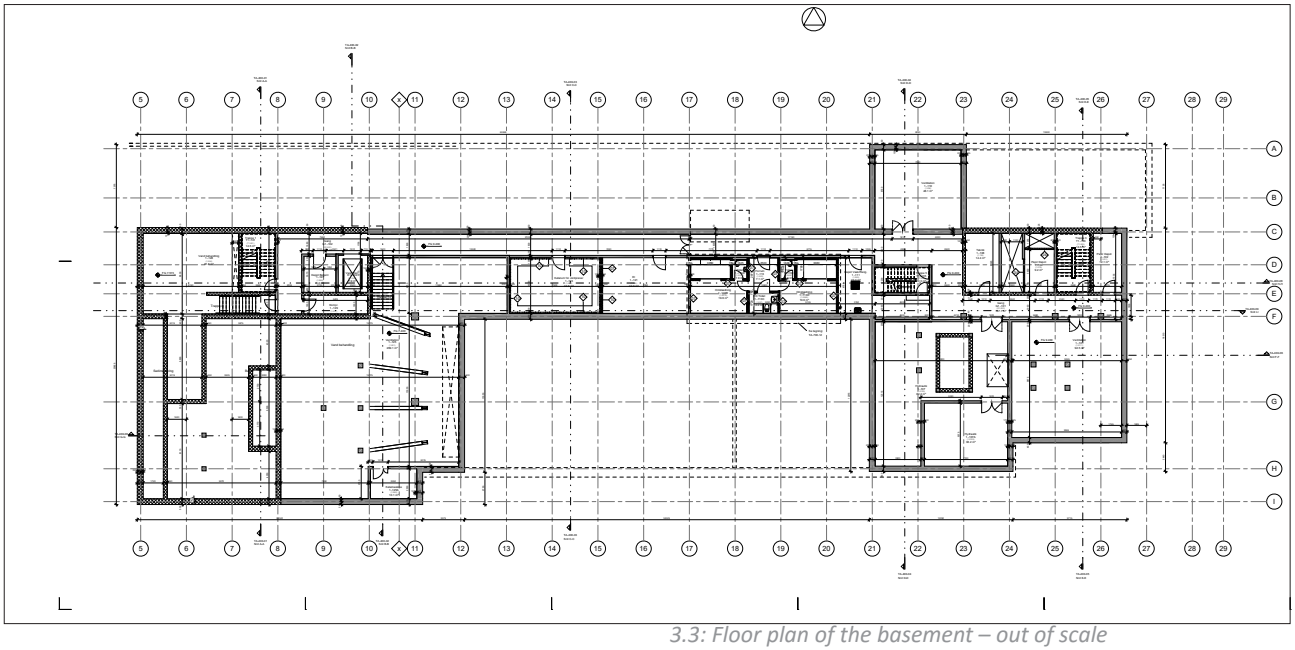


3.1: Site plan of Campus West – out of scale

3.2: Picture of the southern façade of the building for Department of Civil Engineering

The basement

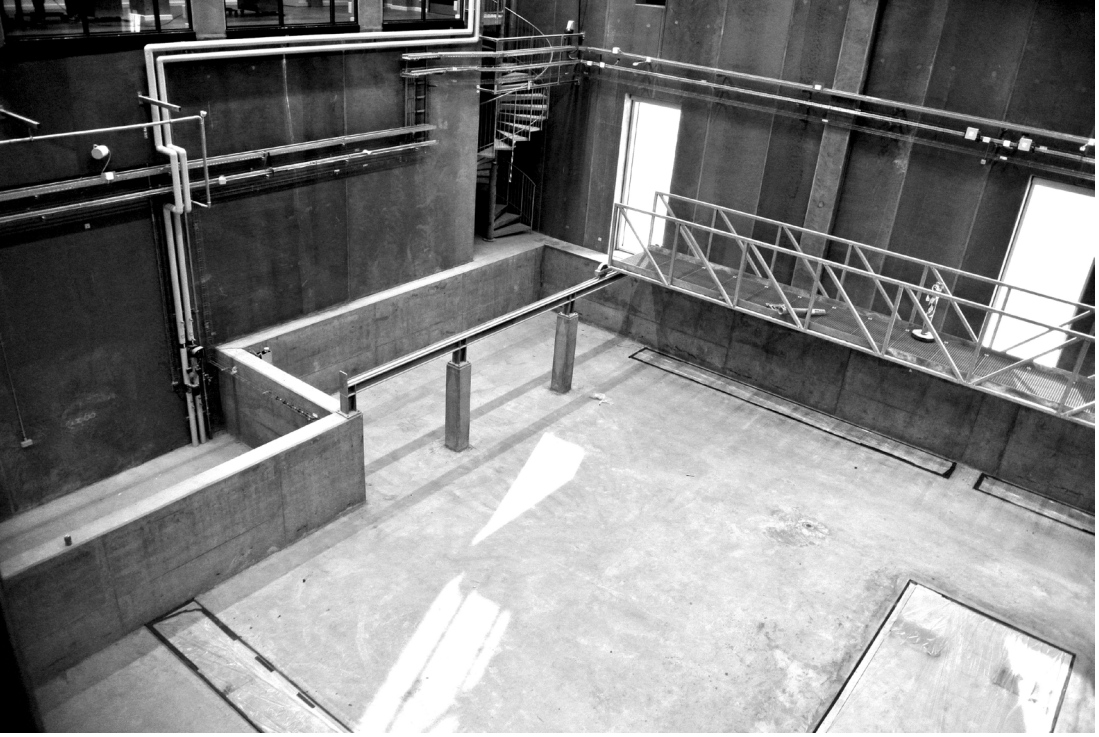
The basement contains water reservoirs and technical rooms serving the laboratories at the ground floor. Additionally, the technical rooms serves the rest of the building such as the ventilation systems and electricity. A cooling room for storage of tests of soil serves the laboratories, and a changing room and bathing facilities serve the employees – in particular, the laboratory employees. According to the laboratories, a storage space for large experimental setups and space for tightening experiments at the clamped deck are also situated in the basement. All these rooms are connected by one aisle (Figure 3.3 and Figure 3.4).



3.3: Floor plan of the basement – out of scale

3.4: Pictures from the basement

http://www.bygst.dk/projekter/aau,-byggeri-og-anlaeg/

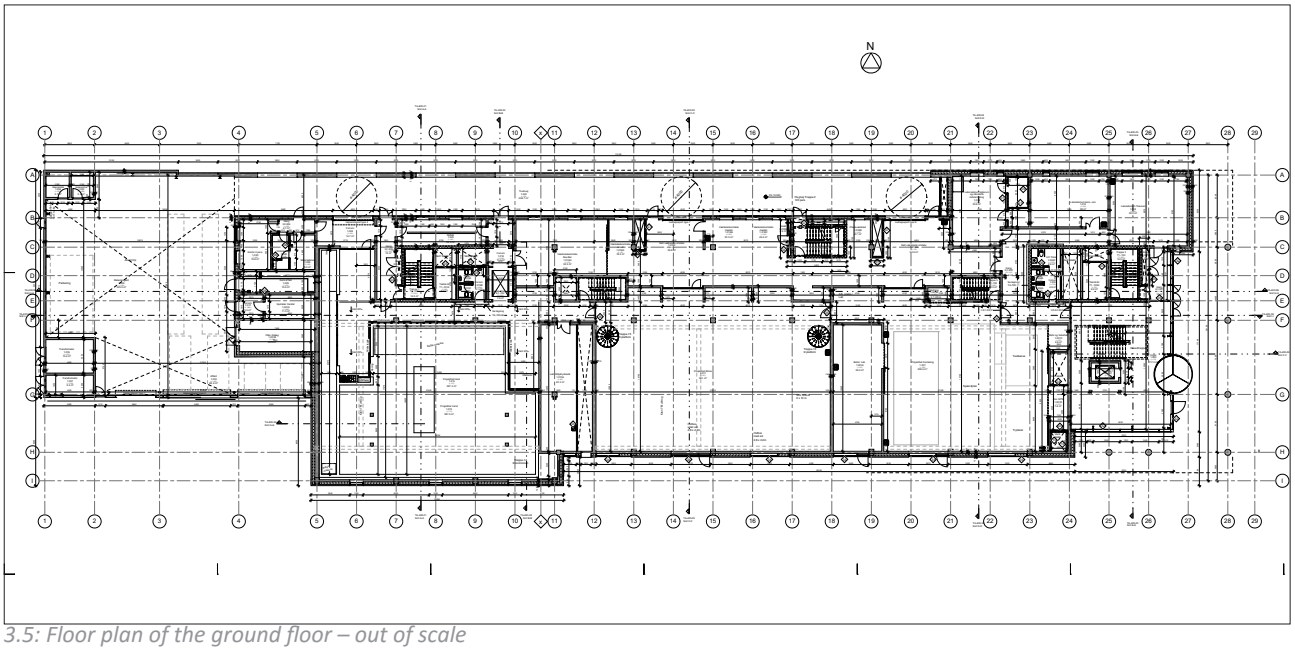


The ground floor

The ground floor contains outdoor spaces and indoor spaces. Outdoor covers an encircled courtyard for materials for the laboratories such as stones and metal. Moreover, the courtyard contains three container bins, space for three cars and roofed spaces for transformer stations, storage of chemicals, refrigerator, and gasses. A roofed, but open aisle for forklift trucks is situated at the northern façade so as to feed the laboratories.

The indoor spaces contain three cores of re-enforced concrete containing fire escapes, toilets, ventilation shafts and technical rooms. Outside the cores, the structural system of the building is a beam-column structure, which is why there are few bearing walls. This structural system was adapted to develop a flexible building for future needs.

At the ground floor, the indoor spaces are initiated by the entrance at the east end. The entrance area is an open three-storey room with an elevator going from the basement to the third floor, while the stair goes from the ground floor to the second floor. The entrance space is a common area where digital screens show the specific activities of a day within the building and where to go to find your room. The room next to the entrance is the laboratory for Structural Research, next to the laboratory for Indoor Environment, the laboratory for Water Environment, and then the laboratory for Large Water Experiment. Towards the north, the paint booth cubical is situated along with the workshops supporting the laboratories. In the east end, three laboratories are situated dealing with straining, consolidation and triax (Figure 3.5 and Figure 3.6).

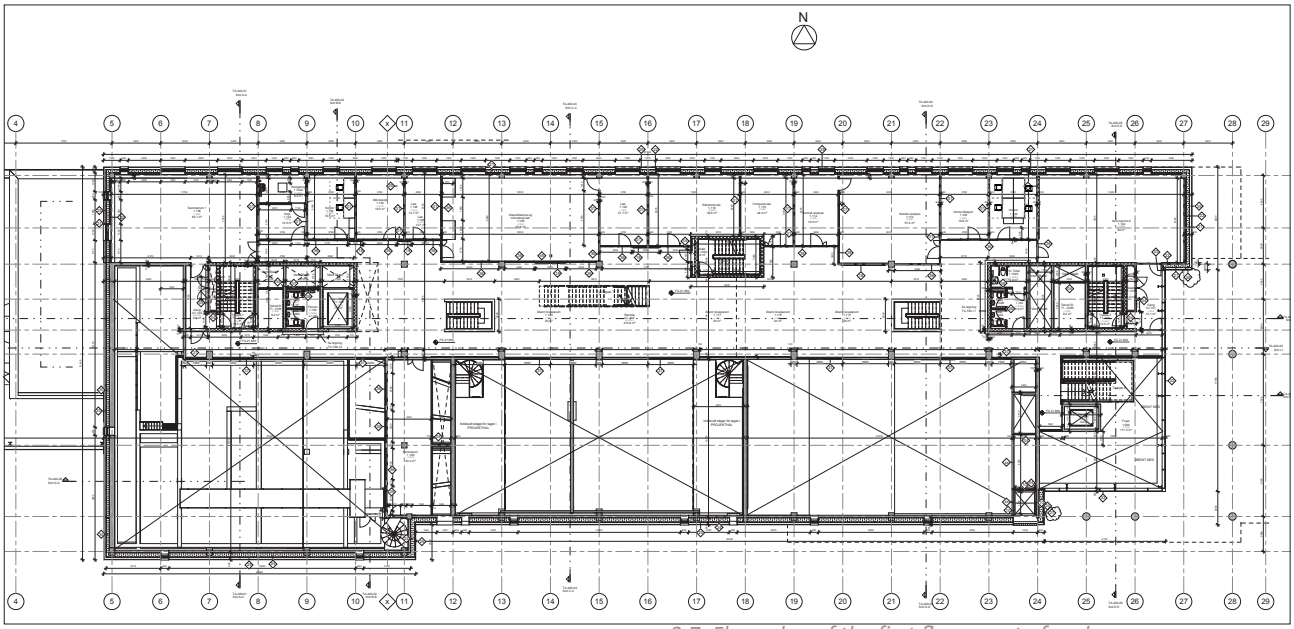


3.5: Floor plan of the ground floor – out of scale

3.6: Pictures from the ground floor

First floor

When arriving at the stairs from the entrance, the Rambla area is the first to enter. The Rambla area is a open area room with visible and acoustic connections to the second and the third floor via open spaces. Moreover, there are visible connections through large, soundproofed windows to the large laboratories at the ground floor towards the south. The area is furnished with tables and chairs for open group rooms for students at the third and fourth semester and couches and lounge chairs for relaxing spaces. Towards the north, the rest of the laboratories are situated such as chemistry and classification, also having a visual connection to the Rambla area with large windows. In both the east and the west ends, a seminar room is situated to hold approximately 50 people.

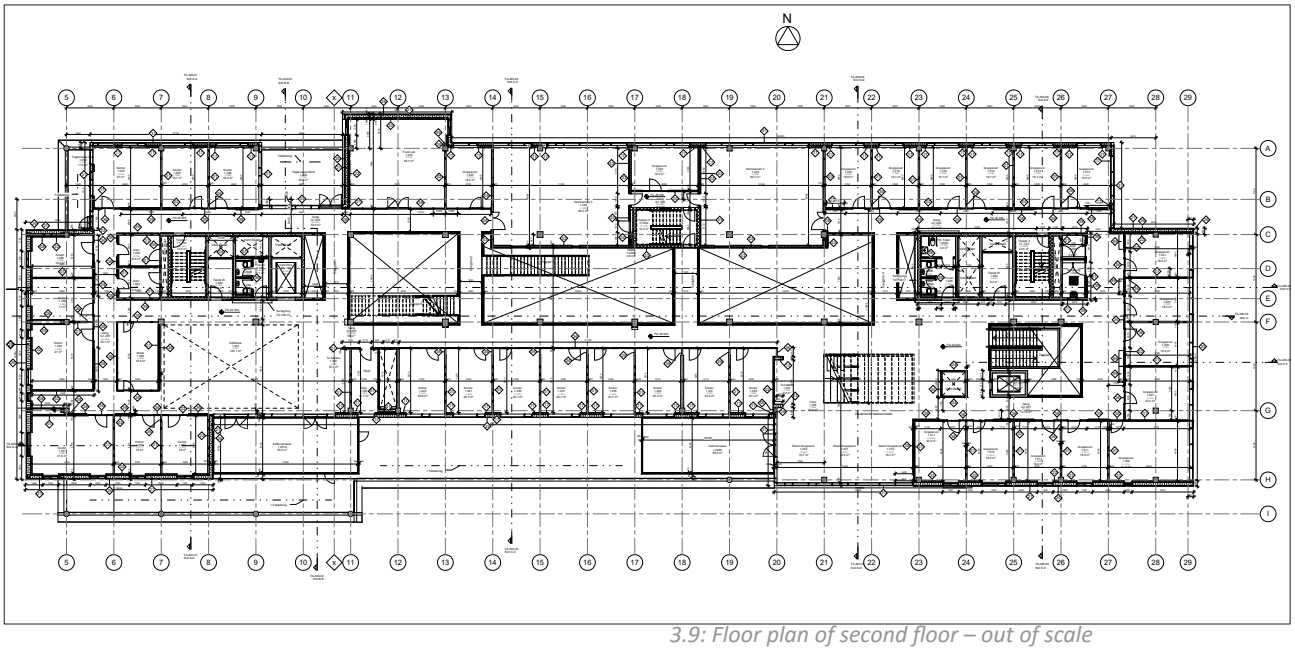


3.7: Floor plan of the first floor – out of scale

3.8: Pictures from the first floor

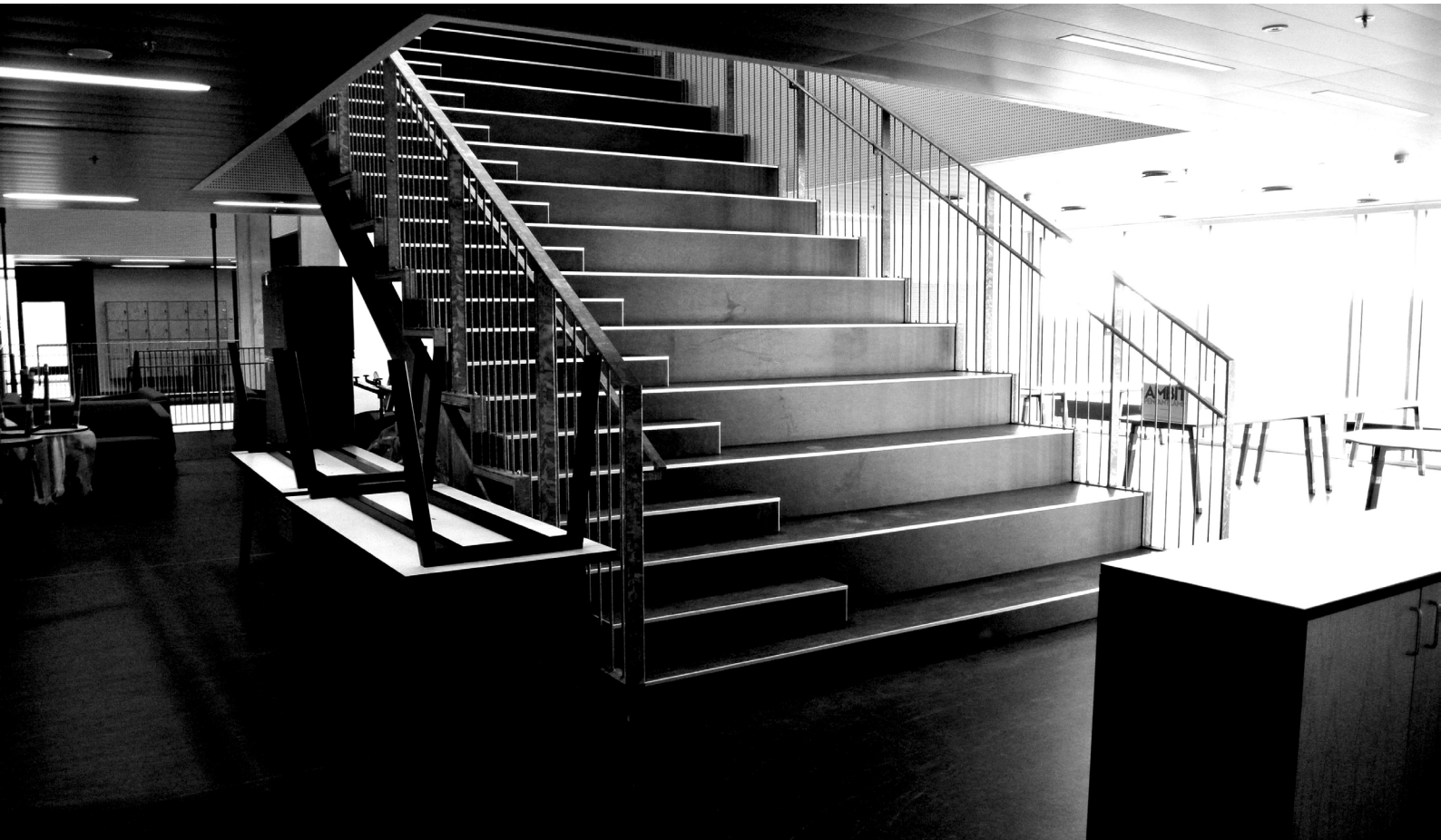
Second floor

The second floor is divided into a section for the employees in the west end and a section for the students in the east end. Towards the northern façade, two seminar rooms are situated to hold approximately 50 people per room. In connection to the group room, the common student area is situated towards the south in connection with a kitchen for the students and an outdoor terrace. In connection with the section for the employees, there is also a common area including a kitchen and a connection to an outdoor terrace. The common area is a two-story room with a visual and acoustic connection to the third floor. The section for the staff also includes two larger meeting rooms for 12 people. At each floor, there are printers for both students and employees (Figure 3.9 and Figure 3.10).



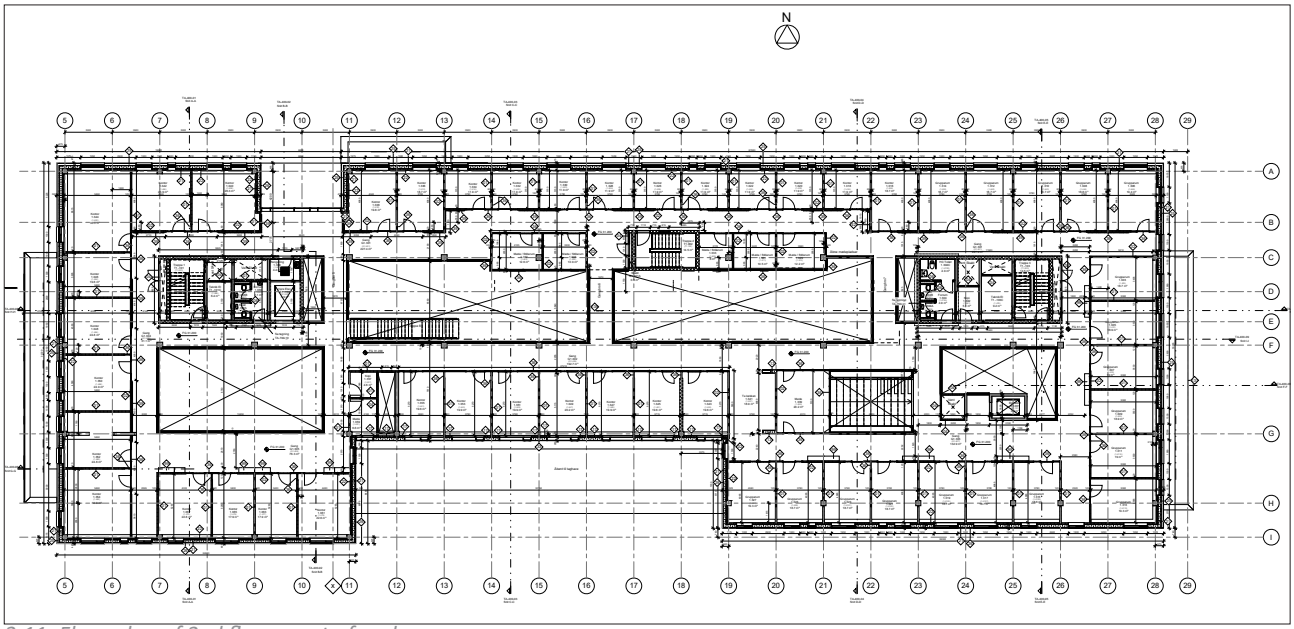
3.9: Floor plan of second floor – out of scale

3.10: Pictures from the second floor



Third floor

The third floor is also divided into a section for the employees in the west end and a section for the students in the east end. In the section for the employees, there is no kitchen at the third floor, but an opening towards the common area for the employees at the second floor. Moreover, there are six meeting rooms for the employees at this floor and one larger meeting room for the students for 12 people. The section for the students is situated in the east end of the building where broad stairs go down to the common area for the students on the second floor (Figure 3.13 and Figure 3.14).



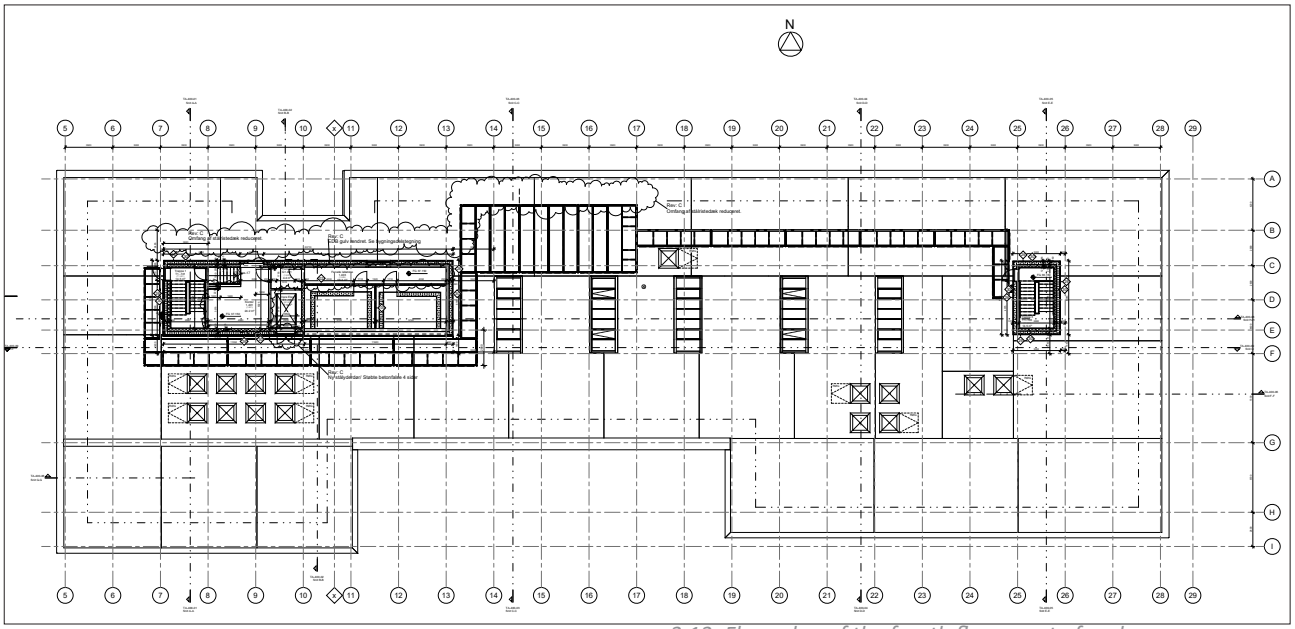
3.11: Floor plan of 3ed floor – out of scale

3.12: Pictures of the 3ed floor

Fourth floor

The fourth floor is both an indoor and outdoor space for laboratories. A control room is situated indoor in between the staircase and the elevator, and on the east side of the elevator the laboratory for experiments with façades, and natural daylight is situated. At the outdoor space, a flat bar grating connects the two elevator shafts because of fire escapes. Outside the laboratory for façades, a larger area of the flat bar grating is situated to make a workspace for the laboratory employees when doing a new experiment. Another larger area of flat bar grating is situated on the east side of the laboratory for façades and is aimed for radars and rain gauges.

Moreover, the roof is covered by skylights and intake of air.



3.13: Floor plan of the fourth floor – out of scale

3.14: Pictures of the fourth floor

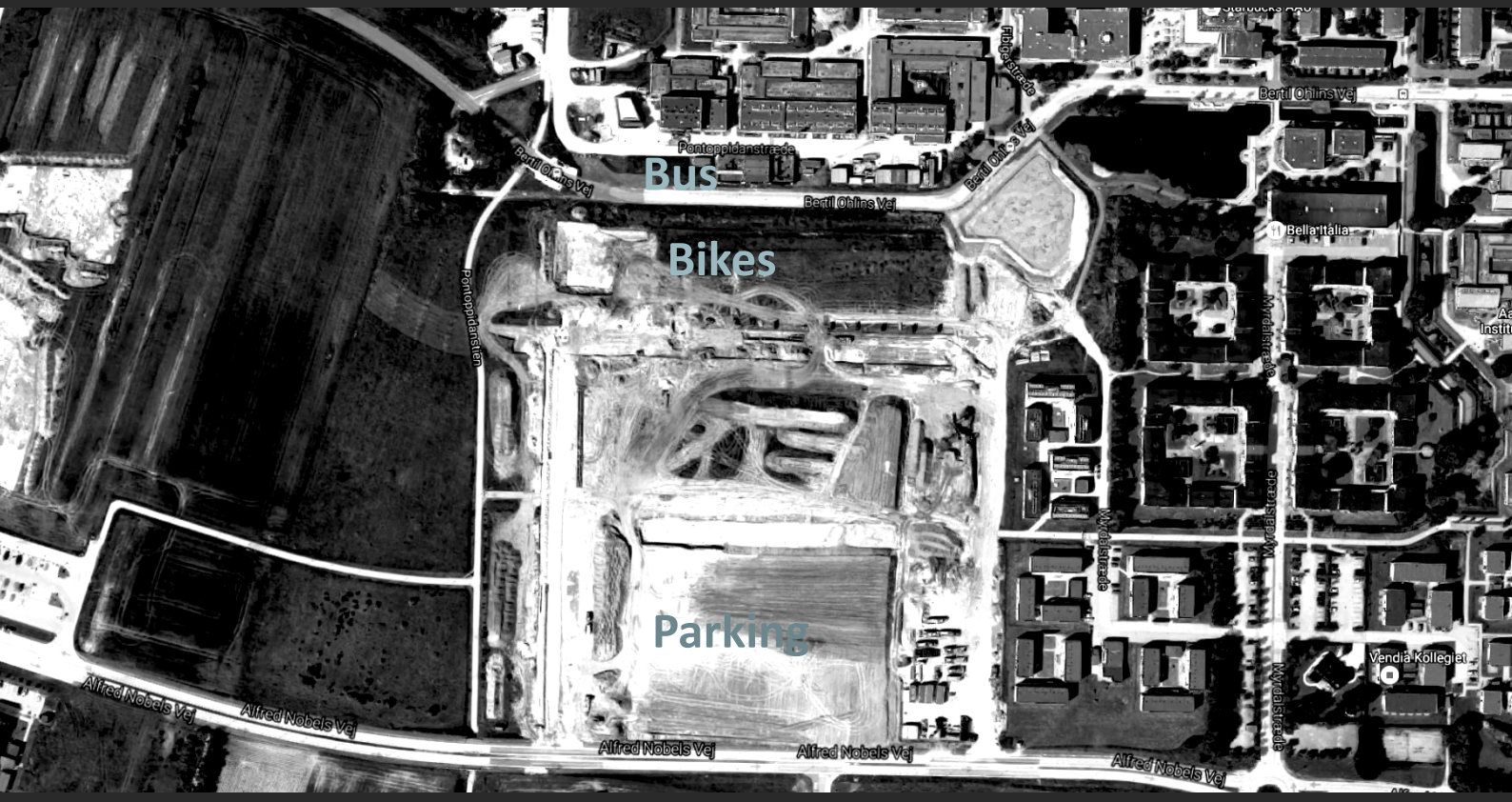
Arrival to the building

The variety of the people within the building causes various arrival opportunities.

When arriving by car, the car can be parked at the parking area situated at the southern end of the building. The parking area is accessible through Alfreds Nobels Vej. Thomas Manns Vej is preferentially allocated soft traffic such as bikes and pedestrians, so cars can drive on Thomas Manns Vej, but cannot park, except if it is for handicapped parking.

Campus Aalborg East is well organized according to bikes. The majority of the students arrive by bikes which is why a large path system for bikes and pedestrians are allocated throughout the Campus Aalborg East. The parking area for the bikes is under roofed parking areas outside the main entrance to the building and in between the vegetation along the road. If this is not enough parking areas, there are roofed parking areas on the north side of the soccer field.

On the north side of the building, the bus road is allocated. During the day the buses often arrive, which is why there is always a bus to catch to go into Aalborg City.



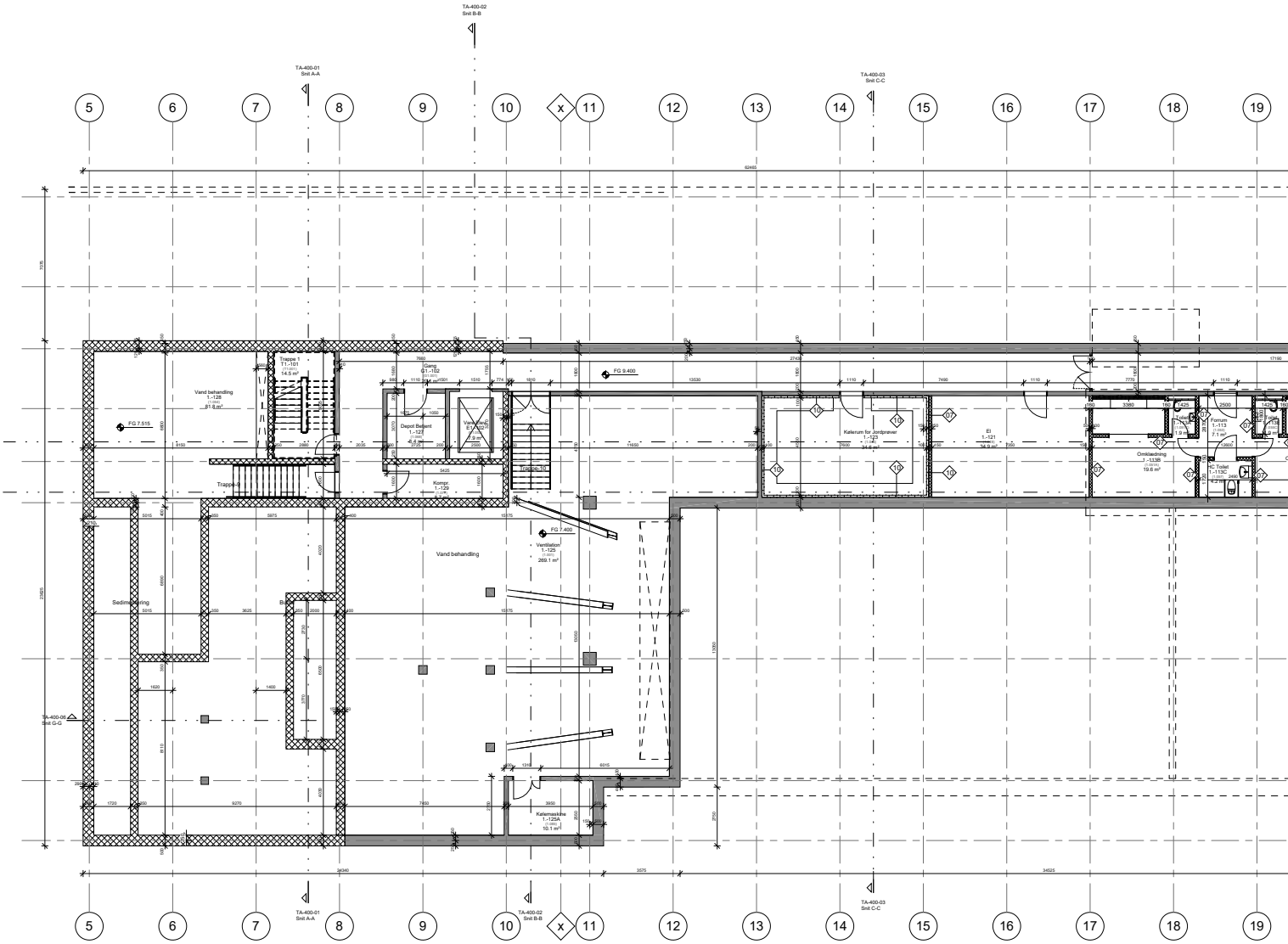
3.15: Map of arrival areas

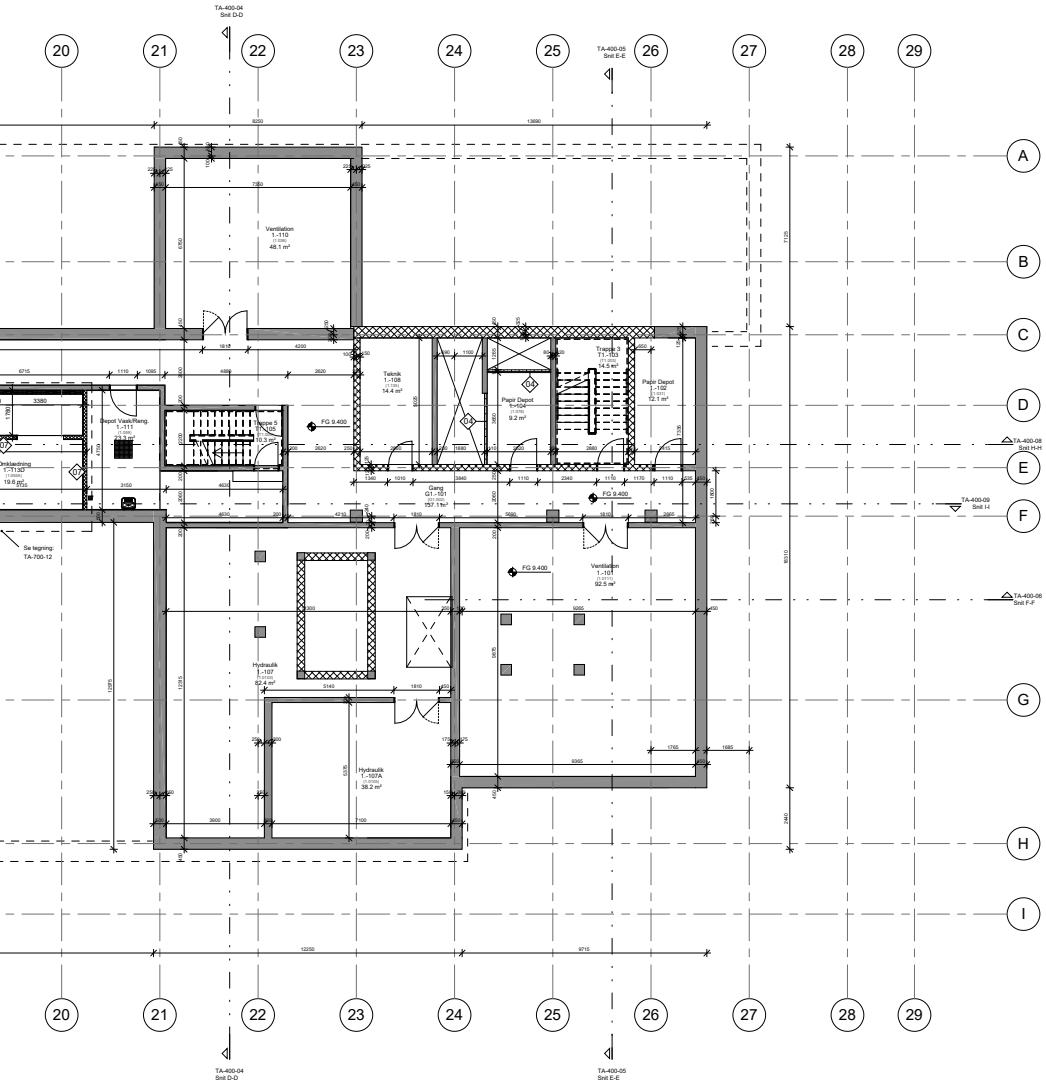
APPENDIX 4

Plan drawings of the building

BASEMENT

Out of scale





Signaturforklaring

Type nr:	Beskrivelse	Klassifikation
01	120 mm Gipspladevæg - 44dB	22.2.01
02	120 mm Gipspladevæg - 48dB	22.2.02
03	170 mm Gipspladevæg - 48dB	22.2.03
04	110 mm Gips forsatsvæg	22.2.04
05	135 mm Gips forsatsvæg	22.2.05
06	125 mm Porebeton	22.2.06
07	150 mm Porebetonvæg	22.2.07
08	70 mm vådrums forsatsvæg	22.2.08
09	95 mm vådrums forsatsvæg	22.2.09
13	295 mm Gipspladevæg	22.2.11
14	83 mm underfagsskarl	22.2.14
18	60mm Akustikpaneler Sort	32.3.17
21	275 mm Let isoleret forsatsydervæg	21.3.01
22	120 mm Let isoleret forsatsydervæg v. ydervæg	21.3.02
24	Forsatsydervæg v. projekthaller	21.3.04
25	200 mm Facadebeklædning	21.3.05
26	50 mm Facadebeklædning	21.3.06
27	70 mm Facadebeklædning	21.3.06
28	185 mm Facadebeklædning	21.3.05
29	375 mm Let isoleret forsatsydervæg	21.3.07
30	260 mm Let isoleret forsatsydervæg	21.3.16
31	230 mm Glas/Alu/Fyldnings facade system	31.1.01
32	260 mm Glas/Alu/Fyldnings facade system	31.1.02
33	310/280 mm Glas/Alu/Fyldnings facade system	31.1.04
34	280 mm Glas/Alu/Fyldnings facade system	31.1.05
35	210 mm Glas/Alu/Fyldnings facade system	31.4.14
36	85 mm Indv. Glaspartier	32.2.05
37	100 mm Indv. Glaspartier	32.2.06
39	60mm Akustikpaneler	32.3.17
41	Gipspanel på skørt	32.3.10
42	Akustikgipspanel på skørt	32.3.11
43	Akustikgips pladevæg	32.3.12

TEGN. NR.:
TA-200-00 F

NOTE Generel 08.05.2015:
Projektjustering i h.t. BesparelsesNotat vers.L/ dato 2015-04-27.

NOTE Alu-facader + Alu-lofter (LUK/AluFac):
Detaljeret udførelse af Alu-facader, herunder justerede detailer, - jvnf. AE-Stålmontage udførelsestegninger.

NOTE Præcisering (LUK/-):
Tæthedsplan med dampspærre-system m.v., jvnf. beskriv.

NOTE Præcisering (LUK/-):
Tæthedsplan i glasfacade med dampspærre konstruktion, jvnf. beskriv.

NOTE Stålværn (SM):
Overfladebehandling indv. stålværn ændret til galvaniseret, samt stål dimensioner ændret. Udvendige stålværn som tegnet udgår, og reduceres til 2 x tværsiser - jvnf. BesparelsesNotat vers. L/ dato 2015-04-27.

NOTE Installationsbænke (LUK/-):
Overfladebehandling ændret til galvaniseret, jvnf. BesparelsesNotat vers. L/ dato 2015-04-27.

NOTE Overvinduer i Systemgipsvægge (TØ):
Overvinduer i Systemgipsvægge udgår, jvnf. BesparelsesNotat vers. L/ dato 2015-04-27.

NOTE Overvinduer i Systemgipsvægge (TØ):
Overvinduer i Systemgipsvægge udgår, jvnf. BesparelsesNotat vers. L/ dato 2015-04-27.

NOTE Malerbehandling (MA):
Malerbehandlinger af gipspladevægge ændret til malerbehandling uden glasfiltvævfylder, jvnf. BesparelsesNotat vers. L/ dato 2015-04-27.

NOTE Fodlister (TØ):
Trælodlister malet i niv.-1 kælder udgår. Stålfodlister ændres til trælodlister, malet, - jvnf. BesparelsesNotat vers. L/ dato 2015-04-27.

NOTE Vægfliser (MU):
Vægfliser 2 sider alm. toiletter samt i Omkladning kæld. Udgår, jvnf. BesparelsesNotat vers. L/ dato 2015-04-27.

NOTE Loftbeklædning over truckvej (TØ):
Traabetonloftfs beklædning incl. nedstroppet underlag er udgået, jvnf. BesparelsesNotat vers. L/ dato 2015-04-27.

NOTE Drænrender langs facader (Byggemodning):
Drænrender langs syd og vestfacader samt drænrende langs facade truckvej er udgået, Belægning truckvej ændret, - jvnf. BesparelsesNotat vers. L/ dato 2015-04-27.

Note 08.05.2015:
Projektjustering og besparelsesrevision Iht. besparelsesnotat, revision L, dato 2015-04-27:

- Vaeg fliser på toilet og omkladning reduceret. Se rumtegninger
- Projekt justering af elevatordørhul, jvnf ing. projekt.
- Ændret signatur for vaegtype 6: porebeton

NOTE:

Denne revision gælder Besparelser-20.01.2015.

Denne revision gælder nye rummumre og nye niveauer.
Eks.: Seminarrum
1.104 = Nyt og fremadrettet rum-nummer
(1.240) = Rum-nummer i h.t. udbudsprojekt.

Niv. 4 = 4.sal
Niv. 3 = 3.sal
Niv. 2 = 2.sal
Niv. 1 = 1.sal
Niv. 0 = Stueetage
Niv. -1 = Kælderetage

F	Rev. af signaturforklaring på planer		03-11-2015
E	Rev. af planer, snit, loftplan, dørskema mv. Dimensioner på glas/alu partier og solltære vinduer opretttet iht. entreprenør		31-10-2015
D	Projektjustering og besparelsesrevision iht. besparelsesnotat, revision L, dato 2015-04-27. iht. skyer og noter.		08-05-2015
C	Revision af niveau betegnelser. Seneste revisionssky bevaret.		30.01.2015
B	Revisoner iht skyer og rum/niv ændring		23.01.2015
A	Revisioner iht skyer		13.11.2014
REV.:	REV. OMFATTER:	INIT.:	DATO:

AALBORG UNIVERSITET
INSTITUT FOR BYGGERI OG ANLÆG

Bygherre:
Bygningsstyrelsen Carl Jacobsens vej 39 2500 Valby

FASE: Hovedprojekt

EMNE: Underetage - Niv. -1 (niv.0)

MÅL: 1:100

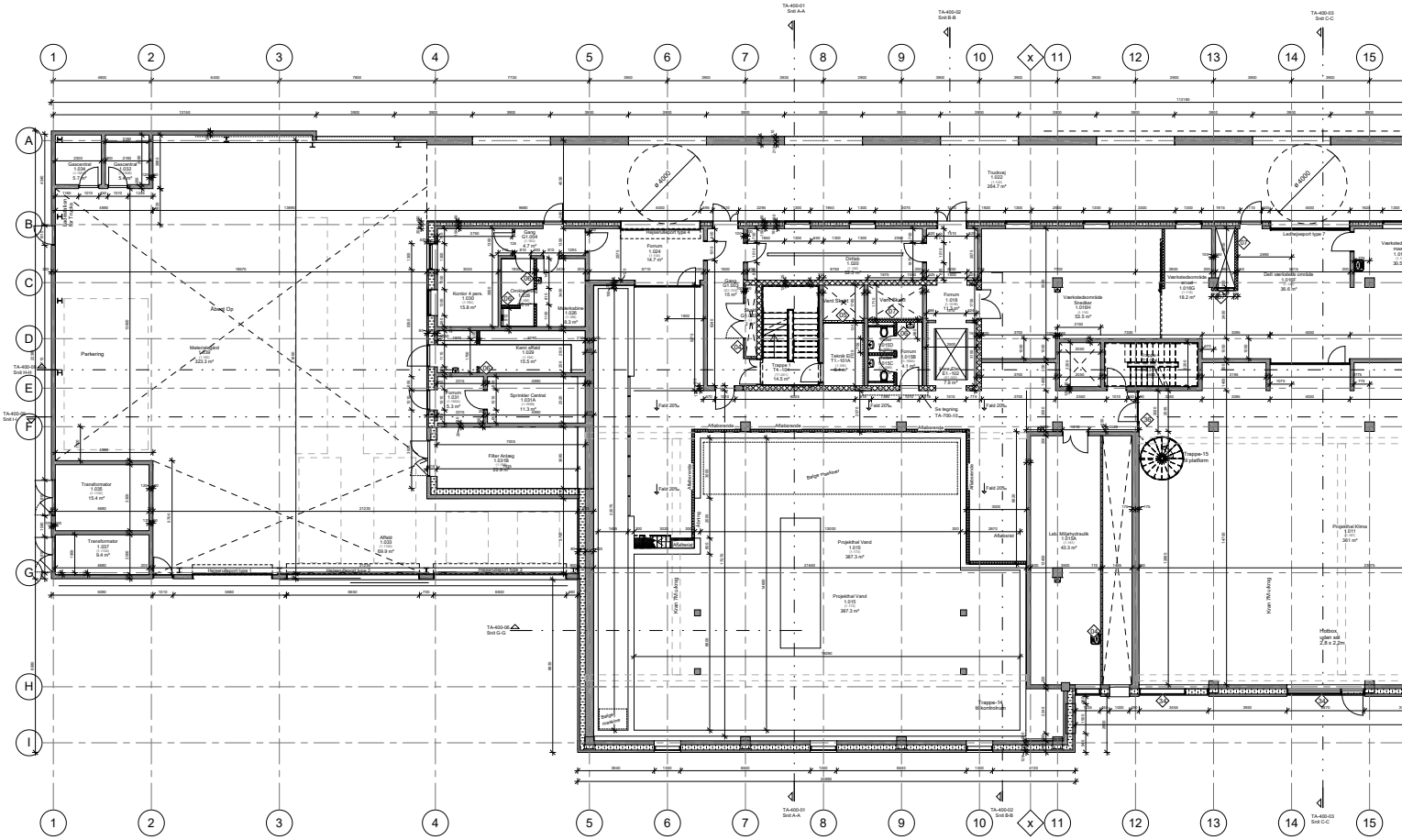
TEGN. NR.:
TA-200-00 F

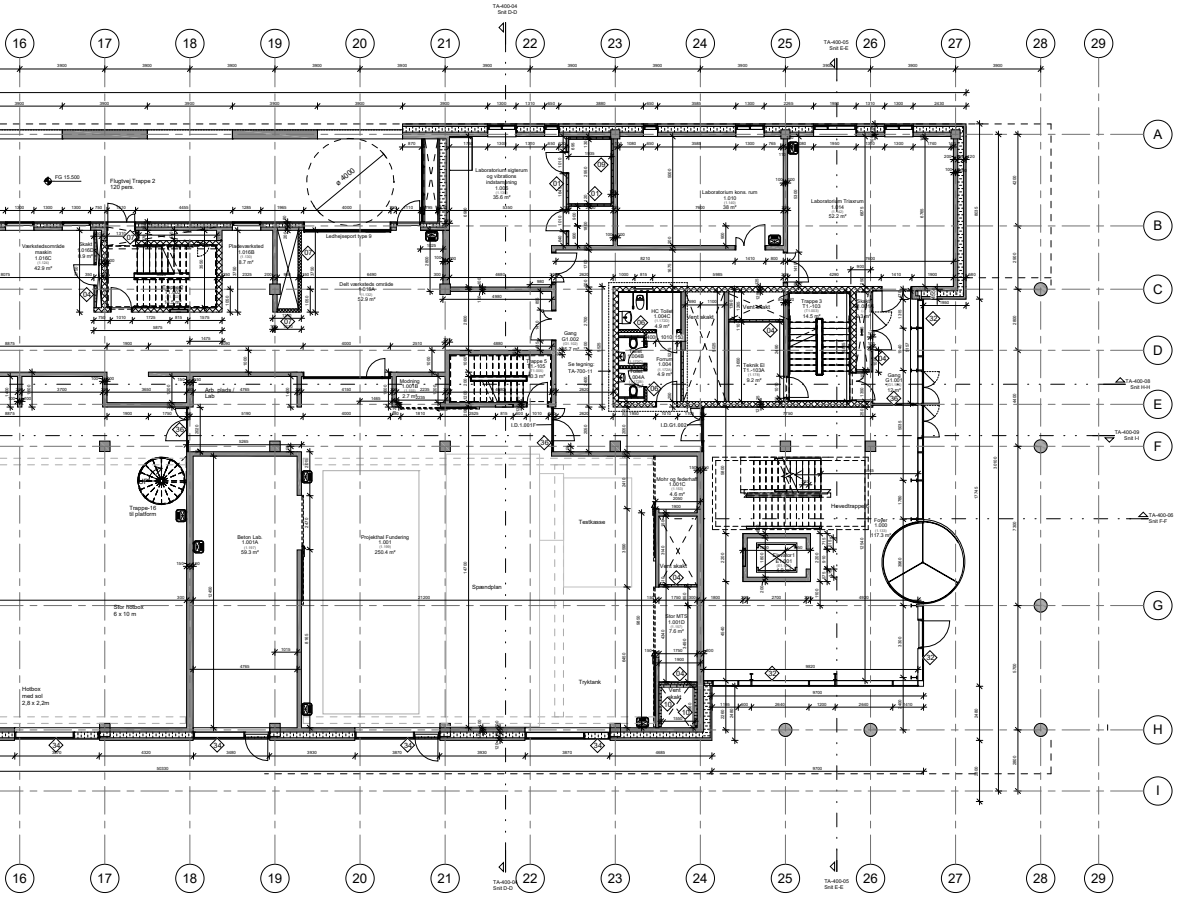
SAGS-NR.: 2.134.04 DATO: 19.06.2014 UDARB.:DSP/INRA GODK.: OM KTRL.: PHO

● ARKITEKTFIRMAET KJÆR & RICHTER A/S — MEJLGADE 7 — 8000 AARHUS C — TLF: 8613 0833 — www.kjaerrichter.dk
○ RAMBØLL DANMARK A/S — PRINSENSGADE 11 — 9000 AALBORG — TLF: 9935 7500 — www.rambol.dk
○ MØLLER & GRØNBORG A/S — MINDEGADE 13, 3. SAL — 8000 AARHUS C — TLF: 8620 3200 — www.mgarkitekter.dk

GROUND FLOOR

Out of scale





Type nr.	Signaturforklaring Beskrivelse	Klass
01	120 mm Gipspladevæg - 44dB	22
02	120 mm Gipspladevæg - 48dB	22
03	170 mm Gipspladevæg - 48dB	22
04	110 mm Gips forsatsvæg	22
05	135 mm Gips forsatsvæg	22
06	125 mm Porebeton	22
07	150 mm Porebetonvæg	22
08	70 mm vådrums forsatsvæg	22
09	95 mm vådrums forsatsvæg	22
13	295 mm Gipspladevæg	22
14	83 mm underlagseskært	22
18	60mm Akustikpaneler Sort	32
21	275 mm Let isoleret forsatsdervæg	21
22	120 mm Let isoleret forsatsdervæg v. ydervæg	21
24	Forsatsdervæg v. projekthøjder	21
25	200 mm Facadebeklædning	21
26	50 mm Facadebeklædning	21
27	70 mm Facadebeklædning	21
28	185 mm Facadebeklædning	21
29	375 mm Let isoleret forsatsdervæg	21
30	260 mm Let isoleret forsatsdervæg	21
31	230 mm Glas/Alu/Fyldnings facade system	31
32	260 mm Glas/Alu/Fyldnings facade system	31
33	310/280 mm Glas/Alu/Fyldnings facade system	31
34	280 mm Glas/Alu/Fyldnings facade system	31
35	210 mm Glas/Alu/Fyldnings facade system	31
36	85 mm Indv. Glaspartier	32
37	100 mm Indv. Glaspartier	32
39	60mm Akustikpaneler	32
41	Gipspanel på skært	32
42	Akustikgipspanel på skært	32
43	Akustikgips pladevæg	32

TEGN. NR
TA-200-01 G

NOTE:

Denne revision gælder Bespareleer-20.01

Denne revision gælder nye rummumme og niveauer:
Eks.: Seminarrum
1.104 = Nyt og fremadrettet rum-nummer
(1.240) = Rum-nummer i h.t. udbudsprojekt

Niv. 4 = 4.sal
Niv. 3 = 3.sal
Niv. 2 = 2.sal
Niv. 1 = 1.sal
Niv. 0 = Stuetage
Niv. -1 = Kælderetage

REV.:	REV. OMFATTER:	INIT.:	DATO:
G	Rev. af signaturforklaring på planer		03-11-2015
F	Rev. af planer, snit, loftplan, dørskema mv. Dimensioner på glas/alu partier og solitære vinduer oprettet iht. entreprenør		31-10-2015
E	Projektjustering og bespareIsesrevision iht. bespareIsesnotat, revision L, dato 2015-04-27. iht. skyer og noter.		08-05-2015
D	Revision iht skyer og rum nr. på niv.0(1)		27.02.2015
C	Revision af niveau betegnelser. Seneste revisionssky bevaret.		30.01.2015
B	Revisioner iht skyer og rum/niv ændring		23.01.2015
A	Revisioner iht skyer		13.11.2014

AALBORG UNIVERSITET
INSTITUT FOR BYGGERI OG ANLÆG

Bygherre:
Bygningsejrelsen Carl Jacobsens vej 39 2500 Valby

FASE: Hovedprojekt
EMNE: Stueplan - Niv. 0 (niv.1)
MÅL: 1:100

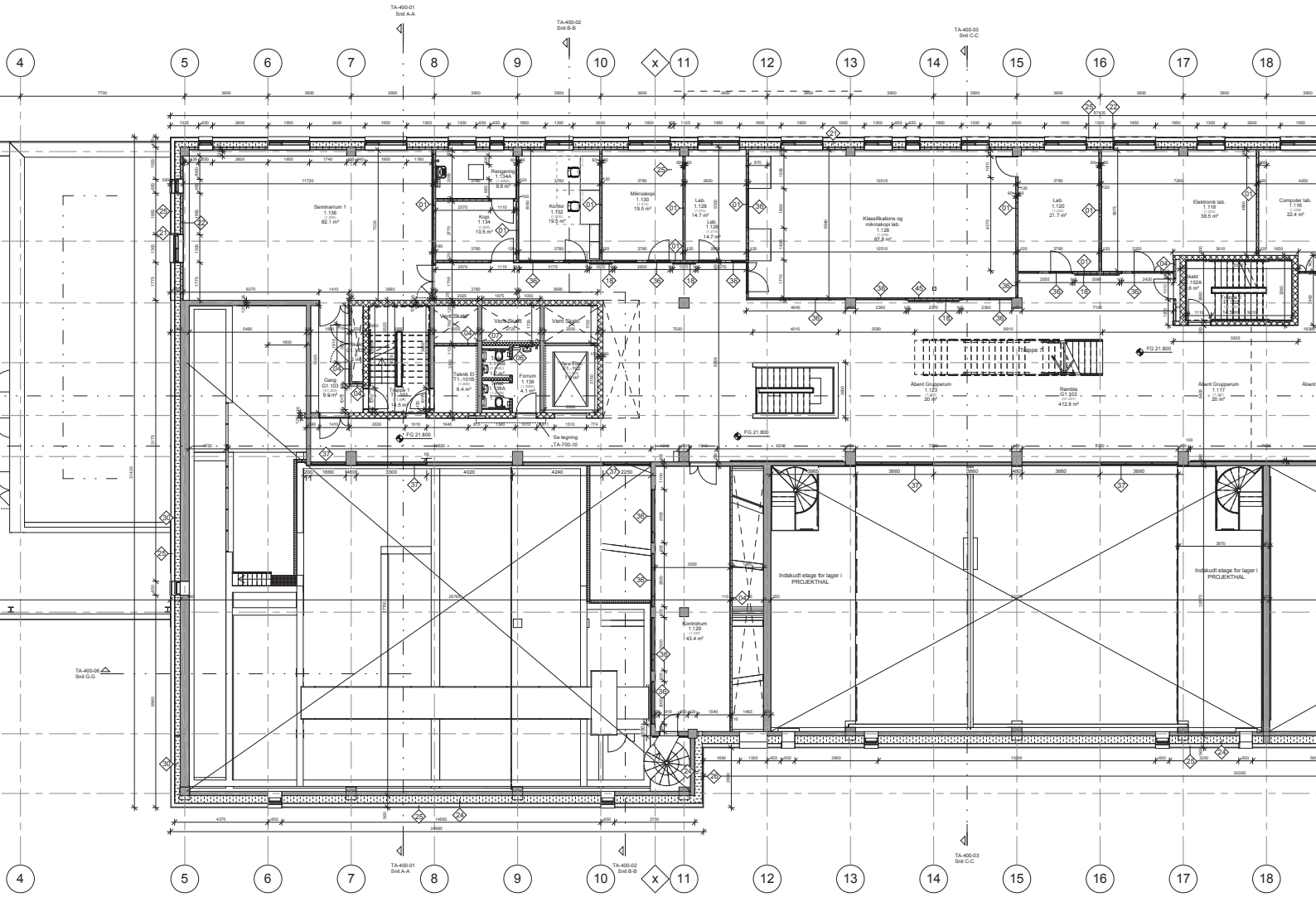
TEGN. NR
TA-200-01 G

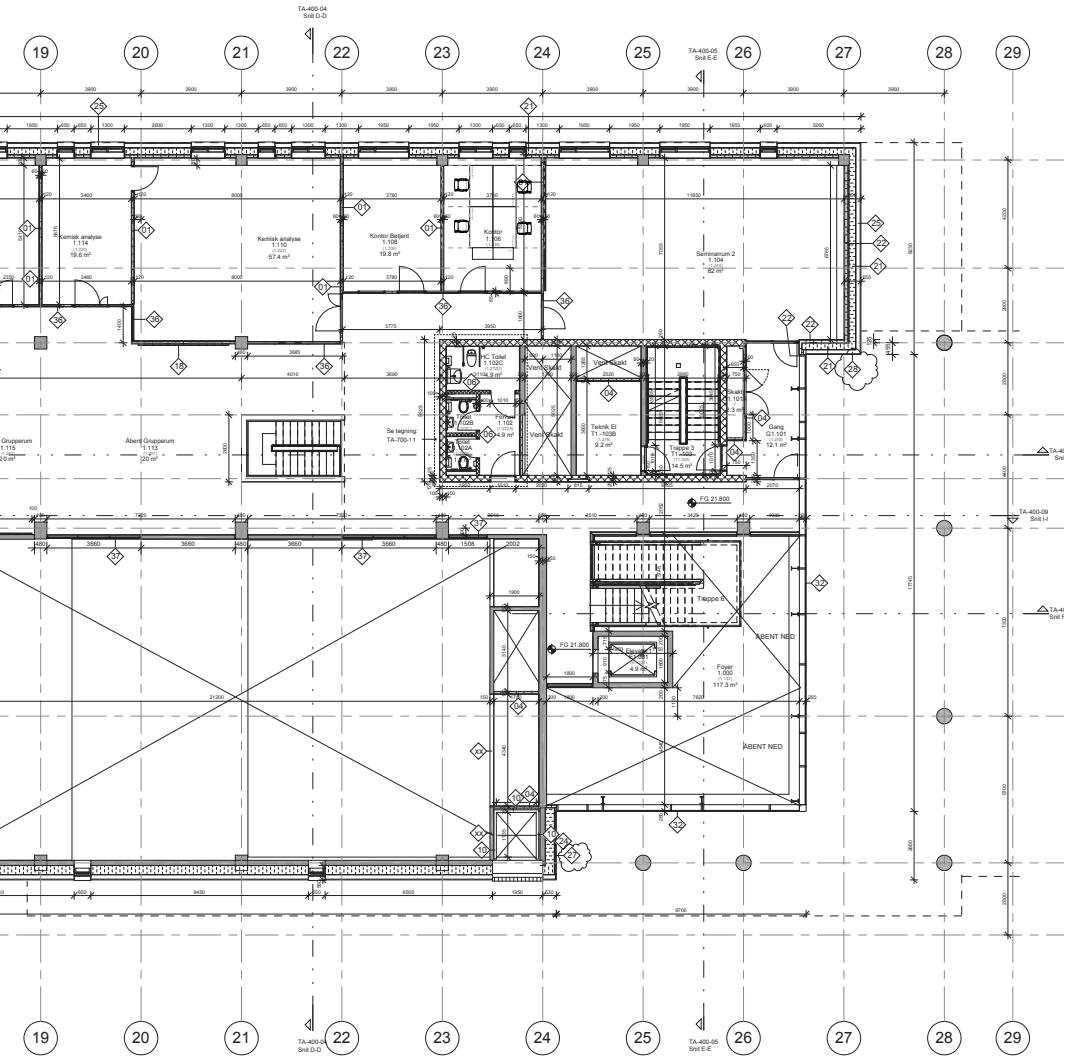
SAGS-NR.: 2.134.04 DATO: 19.06.2014 UDARB.:DSP/NRA GODK.: OM KTRL.: PHO

ARKITEKTFIRMAET KJÆR & RICHTER A/S MEJLGADE 7 8000 AARHUS C TLF: 8613 0633 www.kjaerrichte
RAMBØLL DANMARK A/S PRINSENSGADE 11 9000 AALBORG TLF: 9635 7500 www.rambøll.dk
MØLLER & GRØNBORG A/S MINDEGADE 13, 3. SAL 8000 AARHUS C TLF: 8620 3200 www.mgarkitek

FIRST FLOOR

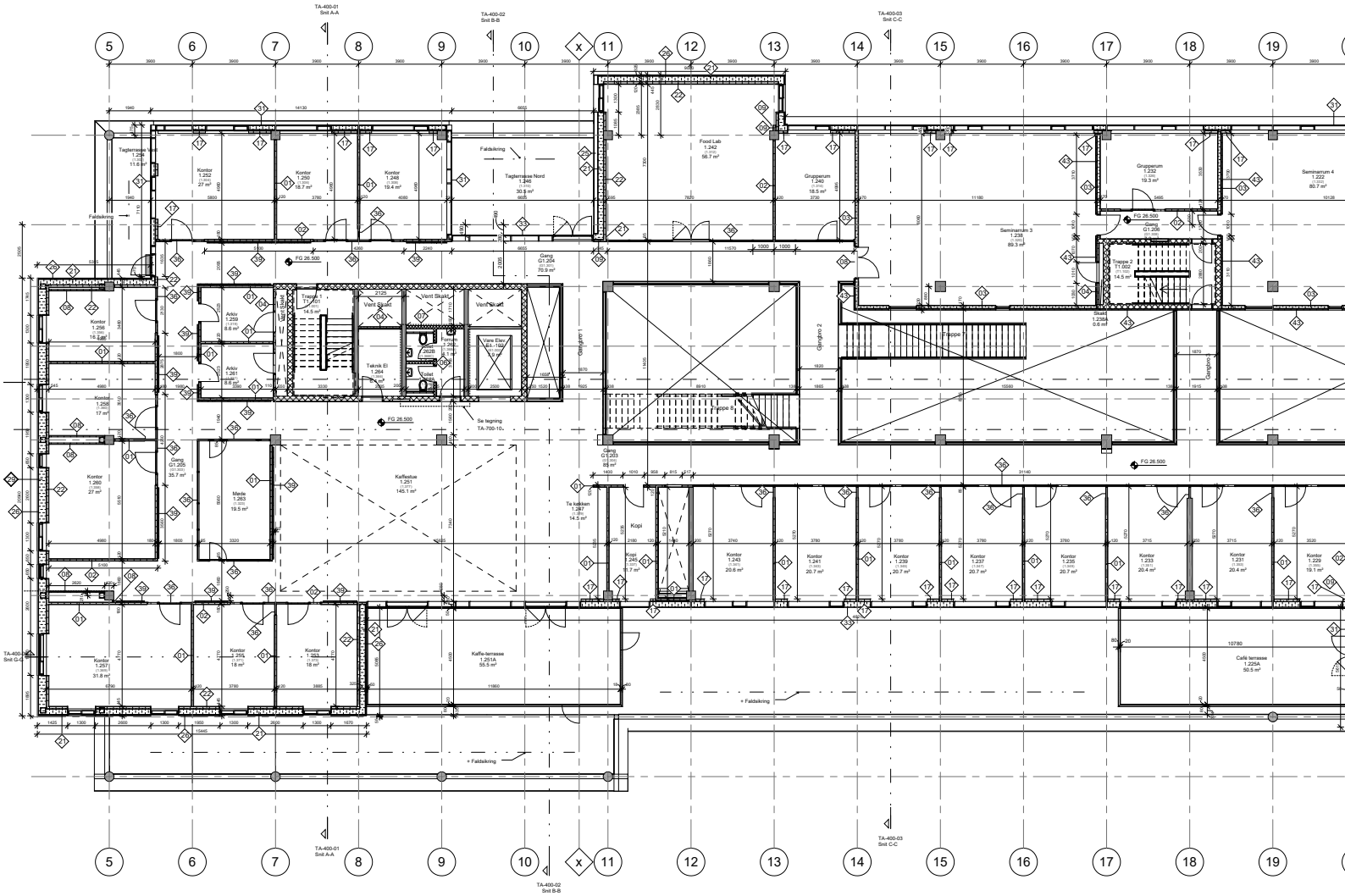
Out of scale

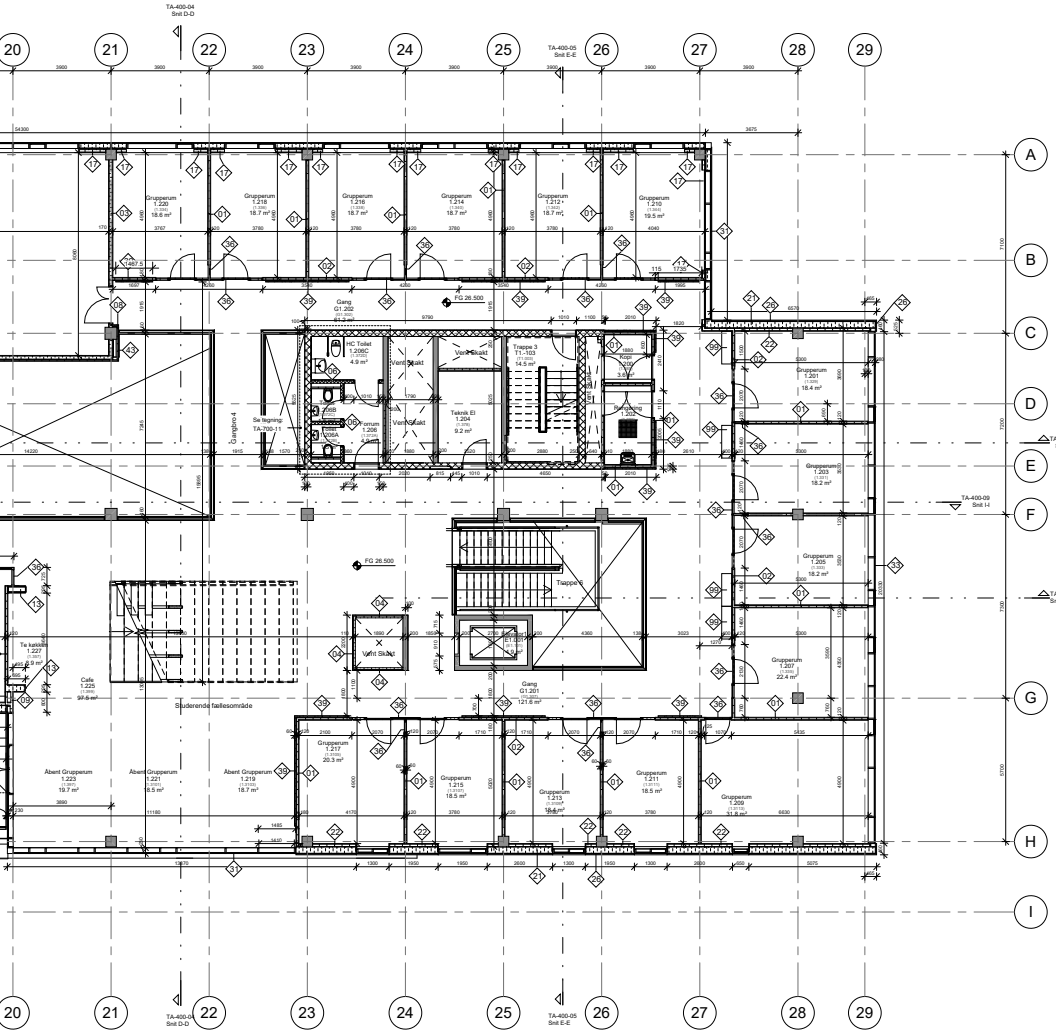



N
19
20
21
22
23
24
25
26
27
28
29
TA-400-04
Snit D-D
TA-400-05
Snit E-E
Kemisk analyse
1.114
19.6 m²
Kemisk analyse
1.110
57.4 m²
Kontor Betjent
1.108
19.8 m²
Kontor
1.106
Seminarrum 2
1.104
92 m²
Gruppe rum
1.115
20 m²
Åbent Gruppe rum
1.113
20 m²
Se tegning:
TA-700-11
WC Toilet
1.102C
1156.9 m²
Vent Skakt
Vent Skakt
Teknik El
T1 -103B
9.2 m²
Trappe 3
T1 -103A
14.5 m²
Skakt
T1.101
2.3 m²
Gang
G1.101
12.1 m²
FG 21.800
Trappe 6
ÅBENT NED
Elevator
4.9 m²
Foyer
1.000
117.3 m²
ÅBENT NED
TA-400-09
Snit I-I

SECOND FLOOR

Out of scale





Signaturforklaring

Type nr:	Beskrivelse	Klassifikation
01	120 mm Gipspladevæg - 44dB	22.2.01
02	120 mm Gipspladevæg - 48dB	22.2.02
03	170 mm Gipspladevæg - 48dB	22.2.03
04	110 mm Gips forsatsvæg	22.2.04
05	135 mm Gips forsatsvæg	22.2.05
06	125 mm Porebeton	22.2.06
07	150 mm Porebetonvæg	22.2.07
08	70 mm vådrums forsatsvæg	22.2.08
09	95 mm vådrums forsatsvæg	22.2.09
13	295 mm Gipspladevæg	22.2.11
14	83 mm underlagsskørt	22.2.14
18	60mm Akustikpaneler Sort	32.3.17
21	275 mm Let isoleret forsatsydervæg	21.3.01
22	120 mm Let isoleret forsatsydervæg v. ydervæg	21.3.02
24	Forsatsydervæg v. projekthaller	21.3.04
25	200 mm Facadebeklædning	21.3.05
26	50 mm Facadebeklædning	21.3.06
27	70 mm Facadebeklædning	21.3.06
28	185 mm Facadebeklædning	21.3.05
29	375 mm Let isoleret forsatsydervæg	21.3.07
30	260 mm Let isoleret forsatsydervæg	21.3.16
31	230 mm Glas/Alu/Fyldnings facade system	31.1.01
32	260 mm Glas/Alu/Fyldnings facade system	31.1.02
33	310/280 mm Glas/Alu/Fyldnings facade system	31.1.04
34	280 mm Glas/Alu/Fyldnings facade system	31.1.05
35	210 mm Glas/Alu/Fyldnings facade system	31.4.14
36	85 mm Indv. Glaspartier	32.2.05
37	100 mm Indv. Glaspartier	32.2.06
39	60mm Akustikpaneler	32.3.17
41	Gipspanel på skørt	32.3.10
42	Akustikgipspanel på skørt	32.3.11
43	Akustikgips pladevæg	32.3.12

TEGN. NR.:
TA-200-03 G

NOTE:

Denne revision gælder Besparelser-20.01.2015.

Denne revision gælder nye rummumre og nye niveauer.
Eks.: Seminarrum
1.104 = Nyt og fremadrettet rum-nummer
(1.240) = Rum-nummer i h.t. udbudsprojekt.

Niv. 4 = 4.sal
Niv. 3 = 3.sal
Niv. 2 = 2.sal
Niv. 1 = 1.sal
Niv. 0 = Stuetage
Niv. -1 = Kældretage

G	Rev. af signaturforklaring på planer		03-11-2015
F	Rev. af planer, snit, loftplan, dørskema mv. Dimensioner på glas/alu partier og solitære vinduer oprettet Iht. entreprenør		31-10-2015
E	Projektjusteringer iht. Jorton møde 20-08-2015. Forsatsvægge + glas/alu facader		21-08-2015
D	Projektjustering og besparelsesrevision Iht. besparelsesnotat, revision L, dato 2015-04-27. iht. skyer og noter.		08-05-2015
C	Revision iht skyer og rum nr. på niv.0(1)		27.02.2015
B	Revision af niveau betegnelser. Seneste revisionssky bevaret.		30.01.2015
A	Revisoner iht skyer og rum/niv ændring		23.01.2015
REV.:	REV. OMFATTER:	INIT.:	DATO:

AALBORG UNIVERSITET
INSTITUT FOR BYGGERI OG ANLÆG

Bygherre:
Bygningsstyrelsen Carl Jacobsens vej 39 2500 Valby

FASE: Hovedprojekt

EMNE: 2. Salsplan - Niv. 2 (niv.3)

MÅL: 1:100

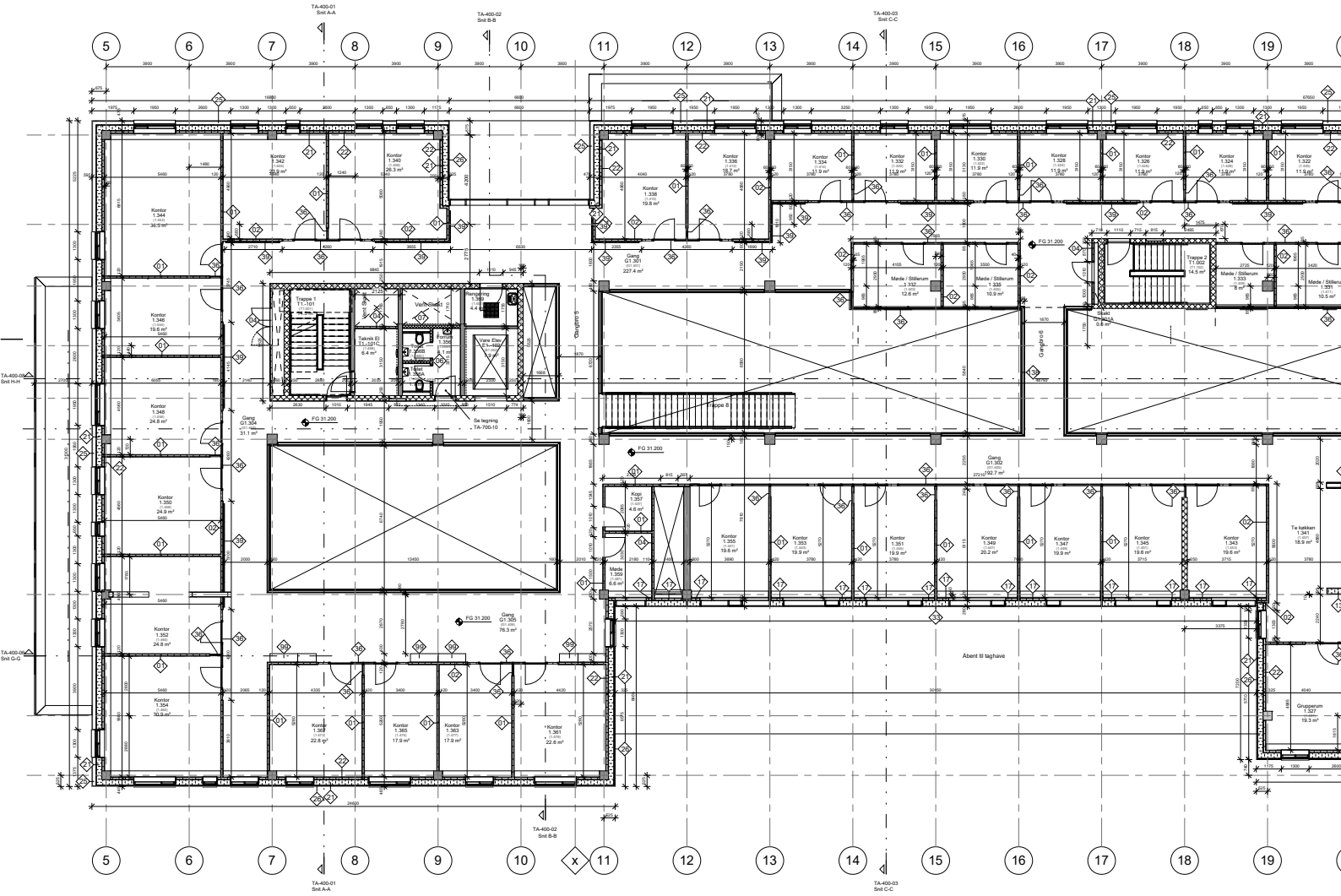
TEGN. NR.:
TA-200-03 G

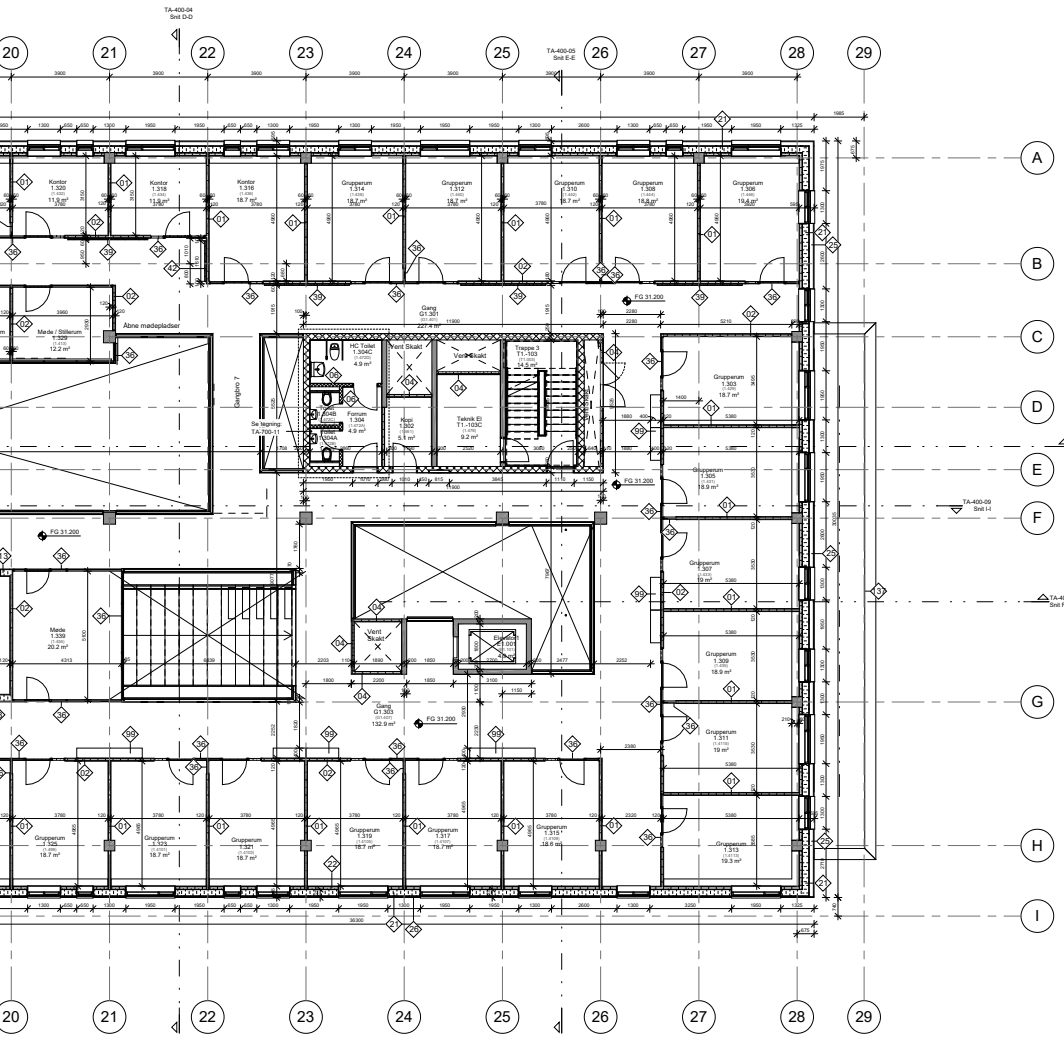
SAGS-NR.: 2.134.04 DATO: 19.06.2014 UDARB.:DSP/NRA GODK.: OM KTRL.: PHO

● ARKITEKTFIRMAET KJÆER & RICHTER A/S — MEJLGADE 7 — 8000 AARHUS C — TLF: 8613 0633 — www.kjaerrichter.dk
○ RAMBØLL DANMARK A/S — PRINSENSGADE 11 — 9000 AALBORG — TLF: 9935 7500 — www.rambol.dk
○ MØLLER & GRØNBORG A/S — MINDEGADE 13, 3. SAL — 8000 AARHUS C — TLF: 8620 3200 — www.mgarkitekter.dk

THIRD FLOOR

Out of scale





Signaturforklaring

Type nr.	Beskrivelse	Klassifikation
01	120 mm Gipspladevæg - 44dB	22.2.01
02	120 mm Gipspladevæg - 48dB	22.2.02
03	170 mm Gipspladevæg - 48dB	22.2.03
04	110 mm Gips forsatsvæg	22.2.04
05	135 mm Gips forsatsvæg	22.2.05
06	125 mm Porebeton	22.2.06
07	150 mm Porebetonvæg	22.2.07
08	70 mm vådrums forsatsvæg	22.2.08
09	95 mm vådrums forsatsvæg	22.2.09
13	295 mm Gipspladevæg	22.2.11
14	83 mm undertagsskært	22.2.14
18	60mm Akustikpaneler Sort	32.3.17
21	275 mm Let Isoleret forsatsdervæg	21.3.01
22	120 mm Let isoleret forsatsdervæg v. ydervæg	21.3.02
24	Forsatsdervæg v. projekthaller	21.3.04
25	200 mm Facadebeklædning	21.3.05
26	50 mm Facadebeklædning	21.3.06
27	70 mm Facadebeklædning	21.3.06
28	185 mm Facadebeklædning	21.3.05
29	375 mm Let Isoleret forsatsdervæg	21.3.07
30	260 mm Let Isoleret forsatsdervæg	21.3.16
31	230 mm Glas/Alu/Fyldnings facade system	31.1.01
32	260 mm Glas/Alu/Fyldnings facade system	31.1.02
33	310/280 mm Glas/Alu/Fyldnings facade system	31.1.04
34	280 mm Glas/Alu/Fyldnings facade system	31.1.05
35	210 mm Glas/Alu/Fyldnings facade system	31.4.14
36	85 mm Indv. Glaspartier	32.2.05
37	100 mm Indv. Glaspartier	32.2.06
39	60mm Akustikpaneler	32.3.17
41	Gipsparel på skært	32.3.10
42	Akustikgipsparel på skært	32.3.11
43	Akustikgips pladevæg	32.3.12

TEGN. NR.:
TA-200-04 G

NOTE:

Denne revision gælder Besparelser-20.01.2015.

Denne revision gælder nye rumnumre og nye niveauer.
Eks.: Seminarrum
1.104 = Nyt og fremadrettet rum-nummer
(1.240) = Rum-nummer i h.t. udbudsprojekt.

Niv. 4 = 4.sal
Niv. 3 = 3.sal
Niv. 2 = 2.sal
Niv. 1 = 1.sal
Niv. 0 = Stueetage
Niv. -1 = Kælderetage

G	Rev. af signaturforklaring på planer		03-11-2015
F	Rev. af planer, snit, loftplan, dørskema mv. Dimensioner på glas/alu partier og solitære vinduer oprettet iht. entreprenør		31-10-2015
E	Projektjusteringer iht. Jorton møde 20-08-2015. Forsatsvægge + glas/alu facader		21-08-2015
D	Projektjustering		28-05-2015
C	Projektjustering og besparelsesrevision iht. besparelsesnotat, revision L, dato 2015-04-27. iht. skyer og noter.		08-05-2015
B	Revision af niveau betegnelser. Seneste revisionssky bevaret.		30.01.2015
A	Revisoner iht skyer og rum/niv ændring		23.01.2015
REV.:	REV. OMFATTER:	INIT.:	DATO:

AALBORG UNIVERSITET
INSTITUT FOR BYGGERI OG ANLÆG

Bygherre:
Bygningsstyrelsen Carl Jacobsens vej 39 2500 Valby

FASE: Hovedprojekt
EMNE: 3. Salsplan - Niv. 3 (niv.4)
MÅL: 1:100

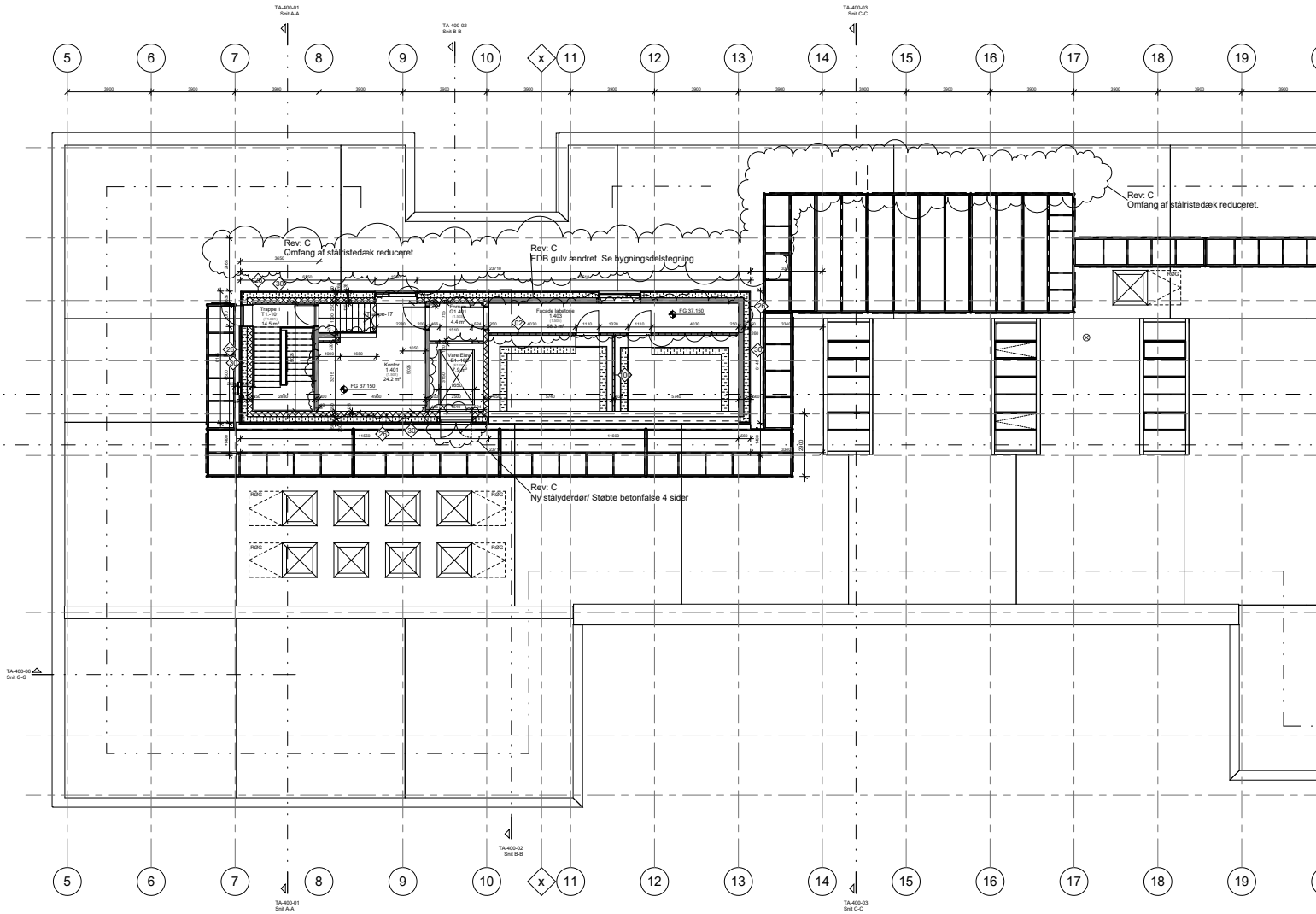
TEGN. NR.:
TA-200-04 G

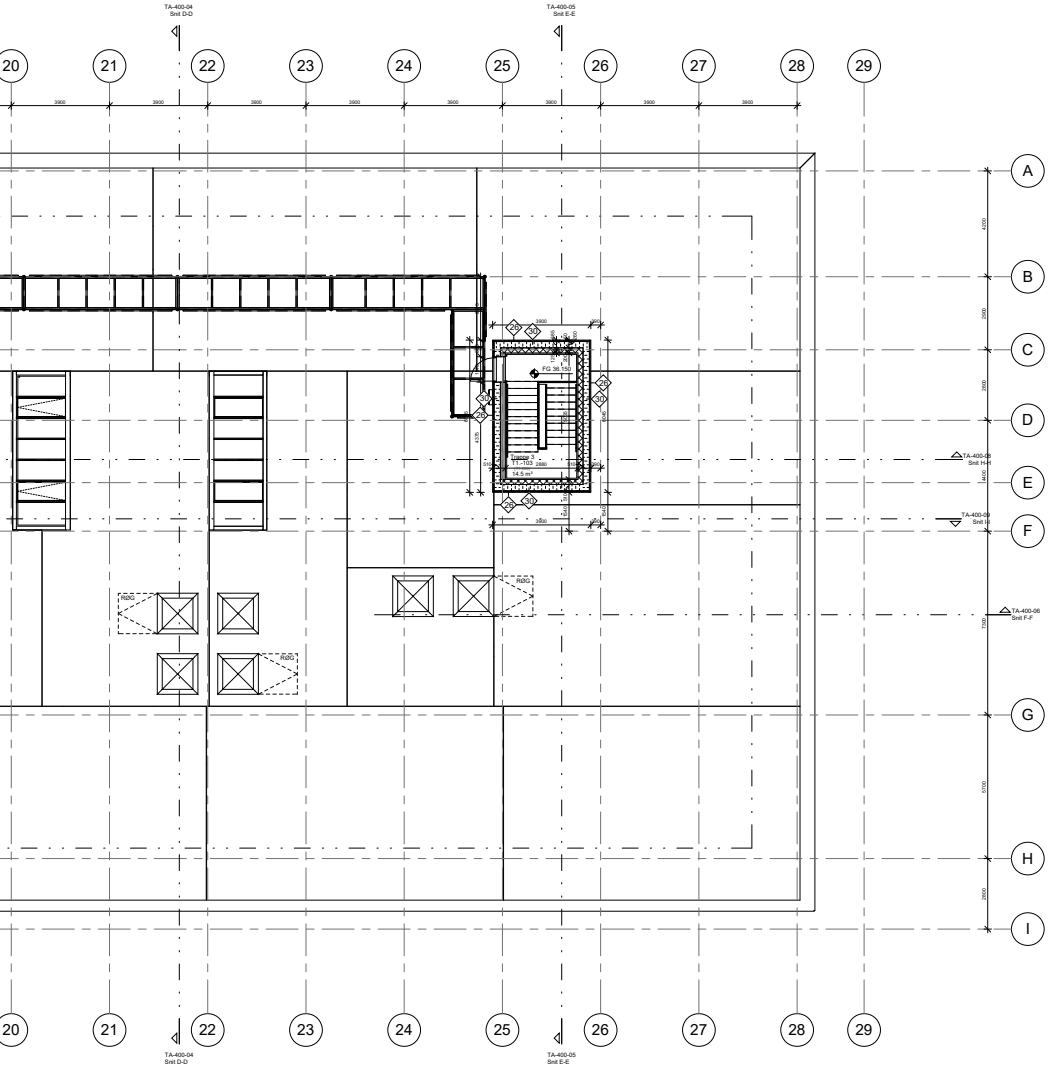
SAGS-NR.: 2.134.04 DATO: 19.06.2014 UDARB.:DSP/NRA GODK.: OM KTRL.: PHO

● ARKITEKTFIRMAET KJÆER & RICHTER A/S — MEJLGADE 7 — 8000 AARHUS C — TLF: 8613 0833 — www.kjaerrichter.dk
○ RAMBØLL DANMARK A/S — PRINSENSGADE 11 — 9000 AALBORG — TLF: 9935 7500 — www.rambol.dk
○ MØLLER & GRØNBORG A/S — MINDEGADE 13, 3. SAL — 8000 AARHUS C — TLF: 8620 3200 — www.mgarkitekter.dk

FIRTH FLOOR

Out of scale





Signaturforklaring

Type nr:	Beskrivelse	Klassifikation
01	120 mm Gipspladevæg - 44dB	22.2.01
02	120 mm Gipspladevæg - 48dB	22.2.02
03	170 mm Gipspladevæg - 48dB	22.2.03
04	110 mm Gips forsatsvæg	22.2.04
05	135 mm Gips forsatsvæg	22.2.05
06	125 mm Porebeton	22.2.06
07	150 mm Porebetonvæg	22.2.07
08	70 mm vådrums forsatsvæg	22.2.08
09	95 mm vådrums forsatsvæg	22.2.09
13	295 mm Gipspladevæg	22.2.11
14	83 mm underlagsskørt	22.2.14
18	60mm Akustikpaneler Sort	32.3.17
21	275 mm Let isoleret forsatsydervæg	21.3.01
22	120 mm Let isoleret forsatsydervæg v. ydervæg	21.3.02
24	Forsatsydervæg v. projekthaller	21.3.04
25	200 mm Facadebeklædning	21.3.05
26	50 mm Facadebeklædning	21.3.06
26	50 mm Facadebeklædning	21.3.06
29	375 mm Let isoleret forsatsydervæg	21.3.07
30	280 mm Let isoleret forsatsydervæg	21.3.16
31	230 mm Glas/Alu/Fyldnings facade system	31.1.01
32	260 mm Glas/Alu/Fyldnings facade system	31.1.02
33	310 mm Glas/Alu/Fyldnings facade system	31.1.04
34	315 mm Glas/Alu/Fyldnings facade system	31.1.05
35	210 mm Glas/Alu/Fyldnings facade system	31.4.14
36	85 mm Indv. Glaspartier	32.2.05
37	100 mm Indv. Glaspartier	32.2.06
39	60mm Akustikpaneler	32.3.17
41	Gipspanel på skørt	32.3.10
42	Akustikgipspanel på skørt	32.3.11
43	Akustikgips pladevæg	32.3.12

TEGN. NR.:

TA-200-05 C

NOTE Generel 08.05.2015:
Projektjustering i h.t. BesparelsesNotat vers.L/ dato 2015-04-27.

NOTE Alu-facader + Alu-lofter (LUK/AluFac):
Detaljeret udførelse af Alu-facader, herunder justerede detaljer, - jvnf. AE-Stålmontage udførelsestegninger.

NOTE Præcisering (LUK/-):
Tagfredsplan med dampspærre-system m.v., jvnf. beskriv.

NOTE Præcisering (LUK/-):
Tagfredsplan i glasfacade med damptæt konstruktion, jvnf. beskriv.

NOTE Stålværn (SM):
Overfladebehandling indv. stålværn ændret til galvaniseret, samt stål dimensioner ændret. Udvendige stålværn som tegnet udgår, og reduceres til 2 x terrasser - jvnf. BesparelsesNotat vers. L/ dato 2015-04-27.

NOTE Installationsbænke (LUK/-):
Overfladebehandling ændret til galvaniseret, jvnf. BesparelsesNotat vers. L/ dato 2015-04-27.

NOTE Overvinduer i Systemgipsvægge (TØ):
Overvinduer i Systemgipsvægge udgår, jvnf. BesparelsesNotat vers. L/ dato 2015-04-27.

NOTE Overvinduer i Systemgipsvægge (TØ):
Overvinduer i Systemgipsvægge udgår, jvnf. BesparelsesNotat vers. L/ dato 2015-04-27.

NOTE Malerbehandling (MA):
Malerbehandlinger af gipspladevægge ændret til malerbehandling uden glasfiltvandfyldter, jvnf. BesparelsesNotat vers. L/ dato 2015-04-27.

NOTE Fodlister (TØ):
Trælfodlister malet i niv.-1 kældre udgår. Stålfodlister ændres til trælfodlister, malet, - jvnf. BesparelsesNotat vers. L/ dato 2015-04-27.

NOTE Vægfliser (MU):
Vægfliser 2 sider alm. toiletter samt i Omklædning kældre udgår, jvnf. BesparelsesNotat vers. L/ dato 2015-04-27.

NOTE Loftbeklædning over truckvej (TØ):
Træbetonlofts beklædning incl. nedstroppet underlag er udgået, jvnf. BesparelsesNotat vers. L/ dato 2015-04-27.

NOTE Drænrender langs facader (Byggemodning):
Drænrender langs syd og vestfacader samt drænrende langs facade truckvej er udgået. Belægning truckvej ændret, - jvnf. BesparelsesNotat vers. L/ dato 2015-04-27.

Note 08.05.2015:
Projektjustering og besparelsesrevision Iht. besparelsesnotat, revision L, dato 2015-04-27:

- Projekt justering af elevatorarhut, jvnf ing. projekt.

NOTE:

Denne revision gælder Besparelser-20.01.2015.

Denne revision gælder nye rummumre og nye niveauer.
Eks.: Seminarrum
1.104 = Nyt og fremadrettet rum-nummer
(1.240) = Rum-nummer i h.t. udbudsprojekt.

Niv. 4 = 4.sal
Niv. 3 = 3.sal
Niv. 2 = 2.sal
Niv. 1 = 1.sal
Niv. 0 = Stueetage
Niv. -1 = Kældretage

REV.:	REV. OMFATTER:	INIT.:	DATO:
C	Projektjustering og besparelsesrevision Iht. besparelsesnotat, revision L, dato 2015-04-27. iht. skyer og noter.		08-05-2015
B	Revision af niveau betegnelser. Seneste revisionssky bevaret.		30.01.2015
A	Revisoner iht skyer og rum/niv ændring		23.01.2015

AALBORG UNIVERSITET
INSTITUT FOR BYGGERI OG ANLÆG

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EMNE: Facadelab/Trappehuse - Niv. 4 (niv.5)

MÅL: 1:100

TEGN. NR.:

TA-200-05 C

SAGS-NR.: 2.134.04 DATO: 19.06.2014 UDARB.:DSP/INRA GODK.: OM KTRL.: PHO

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ISSN 1901-726X

DCE Technical Report No. 228